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Jane P. Phillips

LANGUAGE LESSONS

IN

ARITHMETIC.

WRITTEN AND ORAL EXERCISES.

BY

ELLEN L. BARTON,

PRINCIPAL PORTLAND SCHOOL FOR DEAF.

BOSTON:
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PREFACE.

THESE Lessons have been the growth of experience in the schoolroom, and have for years been so useful, and have given such pleasure to the author's own classes, that they are now sent forth, in the hope that they may prove equally satisfactory in other schools.

The first steps in numbers are always taken unconsciously; then the teacher carries forward the work by a continual repetition and elaboration, illustrating by objects, with little need at first of a text-book. But the teacher does the best service for the child when teaching him to work independently, — to think and to discover for himself methods of obtaining desired results. This is the primary aim in the present series of lessons: to enable the child to become a guide to himself. When a child is properly directed and encouraged, he takes delight in thinking and doing for himself, notwithstanding he finds more pleasure in solving a problem by the mere hint found in the headline of the page or in an apparently chance phrase, than in solving it by explanations given in the text.

But in order to think out a problem for himself, he needs more than a purely arithmetical language.

The first and hardest part of the solution of any mathematical question is that which, in algebra, is called putting it into equations; that is, in finding out what arithmetical operations are required.

In teaching the pupil to think, his power of using language must be trained; this alone will give him the habit of accurate conception and precise statement capable of arithmetical expression. This end is kept steadily in view through this whole series of lessons. It is for this they are called Language Lessons in Arithmetic.

In order to attain the full benefit of this feature of the book, the questions should all be copied out in writing, and the answers always be written in full. Writing will give more definiteness to the conception, and will impress the forms of speech upon the mind more permanently than reading or speaking. The effect which the book, thus taught, has in developing the power of independent original action in the child has been experimentally found to be very great. The writing should, of course, be also used as an exercise in penmanship, spelling, punctuation, and the use of capitals.

Facts which could be given are left to the industry of the pupil to learn, and numerous references given to such sources of information as are supposed to be within the reach of every child. This adds zest to the work, and helps to form an invaluable habit for life.

ELLEN L. BARTON.

PORTLAND, October, 1885.

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INTRODUCTION.

THE following representative lessons are given as they are intended to be written by the pupil.

The lines between the examples are for the convenience of the teacher in examining the work.

LESSON XXVII. (Page 21.)

1. Four is how many less than nine? Four is five less than nine. Illustrate. $\begin{array}{l} |\,|\,|\,| \\ |\,|\,|\,|\,|\,|\,|\,|\,| \end{array}$.

---

2. Ten is how many more than five? Ten is five more than five. — Than eight? Ten is two more than eight. — Than six? Ten is four more than six. — Than one? Ten is nine more than one. — Than four? Ten is six more than four. — Than three? Ten is seven more than three. — Than two? Ten is eight more than two. — Than seven? Ten is three more than seven. — Than nine? Ten is one more than nine.

---

3. Eight is how many less than ten? Eight is two less than ten. — Than nine? Eight is one less than nine.

4. What number is twice as large as two? *Answer.* Four is twice as large as two. Illustrate with marks: I I, I I, I I.

---

5. What number is twice as large as three? Six is twice as large as three. — As five? Ten is twice as large as five. — As four? Eight is twice as large as four.

---

6. Twice two are how many? Twice two are four. Illustrate with marks. I I, I I.

---

7. How many are twice five? Twice five are ten. — Twice four? Twice four are eight. — Twice one? Twice one are two.

---

8. How many are two and four and one and two? Two and four and one and two are nine. Illustrate with marks, thus: I I I I I I I I I, and with counters.

---

9. What do you use for counters? Some children use beans, some use grains of barley, and some use small cubes, and others use other small objects. I use small cubes.

---

10. Five taken from six leaves how many? Five taken from six leaves one.

11. Leonard left five books lying on the table; Mary put four of them in the bookcase; how many were left on the table? There was one left on the table. — All the books except two were picture-books; how many picture-books were there? There were three picture-books. — Leonard had put new covers on all of them but one; how many had he covered? He had covered four.

LESSON XXVII. (Page 65.)

1. 2 dozen cocoanuts are how many more than 1 dozen? 2 dozen cocoanuts are 12 more than 1 dozen.

2. 12 is what part of 24? 12 is one-half of 24.

3. 19 is how many more than 3 times 3? 19 is 10 more than 3 times 3.

4. 25 is 5 more than how many? 25 is 5 more than 20.

5. 20 is 15 more than what number? 20 is 15 more than 5.

6. What number is twice as many as 2 and 2? 8 is twice as many as 2 and 2.

7. How many times will 8 go in 24? 8 will go in 24 3 times.

---

8. By what number is 8 multiplied to get 24? 8 is multiplied by 3 to get 24.

LESSON XV. (Page 137.)

5. Mr. Perkins, the hardware dealer, bought 6 dozen pairs of skates at \$2 a pair; 3 dozen pairs at \$3 a pair; and 5 dozen pairs at \$1 a pair; how many pairs of skates did he buy?

6 dozen pairs equal 72 pairs.
3 dozen pairs equal 36 pairs.
5 dozen pairs equal 60 pairs.
He bought 168 pairs.

How much did they all cost him?

72 times	36 times	60 times
\$2	\$3	\$1
\$144	\$108	\$60

\$144
108
60
\$312

They all cost \$312.

LANGUAGE LESSONS IN ARITHMETIC.

PART I.

SECTION I.—NUMBERS FROM ONE TO TEN.

LESSON I.

1. Make five marks on your slate; thus, |||||.

2. Make ten marks.

3. Make seven marks.

4. Make nine marks.

5. Make two marks.

6. Count from one to ten, writing the numbers in words; thus, one, two, three, and so on.

7. How many marks are there in this group, ||||? *Answer.* There are four marks.

8. *Always write the question, and write the answer in full.*

9. How many marks are there in this group, |||||||||?

10. How many fingers have you on the hand with which you write? *Answer.* I have four fingers on the hand with which I write.

11. How many fingers have you on your right hand? "Write" and "right" are spoken alike (*rite*).

12. How many fingers have you on your left hand?

LESSON II.

1. How many hands have you?

2. How many thumbs have you?

3. How many fingers are the four fingers on your right hand and the four fingers on your left hand?

4. Count all the fingers and thumbs on both hands, and tell how many fingers and thumbs you have.

5. Four fingers and four fingers are how many fingers?

6. How many are four and one and four and one? *Answer.* Four and one and four and one are ten.

7. How many are one and two and three and four?

8. How many boys are three boys and three boys?

9. How many dogs are two dogs and two dogs?

10. Make marks to show that two and two and two and two and two are ten; thus, **I I I I I I I I I I.**

LESSON III.

1. How many are five and five?

2. How many are four and four?

3. Make a group of three marks, and then make another group of three near the first group; thus, **I I I I I I.** How many groups have you made? How many marks are there in each group? How many marks are there in both groups?

4. *Remember to write all the answers in full.*

5. How many are four and four?

6. How many are two and two? three and three? five and five? one and one? four and four?

7. How many are one and two? two and three? three and two?

8. How many legs has a chair? How many legs have two chairs? Draw a picture of a chair on your slate.

LESSON IV.

1. How many are four and four and one?

2. How many wings has a dove?

3. There were three doves in the street one morning, when the milkcart came along and frightened them all up to the roofs. How many wings had the three doves? How many wheels had the cart? How many ears had the horse? how many feet?

4. How many feet have three doves? have four doves? has one dove?

5. Emma saw five doves, one Sunday morning, near home, and three more near the church. How many doves did she see?

LESSON V.

1. Count from five to ten, writing the numbers in words.

2. How many legs has a fly?

3. Has a fly more than two eyes?

4. How many wings has a fly?

5. How many wings have two flies?

6. How many fins has a fish?

7. If one fish has five fins, how many fins have two fishes? *Answer.* Two fishes have ten fins.

8. How many horns has a cow?

9. How many horns have four cows?

10. How many horns has a yoke of oxen? A yoke of oxen is two oxen yoked together.

11. Find a picture in one of your "Readers" of a yoke of oxen drawing a cart. Of what do you think the yoke is made? Try to draw the yoke on your slate.

12. How many feet has a yoke of oxen? how many horns? how many ears? how many tails?

13. How many feet have the oxen and the driver?

14. How many are four and four? four and four and two?

15. Can you draw the picture of an ox? Try to draw one.

16. Some carts have four wheels and other carts have only two wheels. How many wheels has the cart in the picture which you have found?

17. How many are one and one and two and two and three?

18. How many are one and two and three and four?

19. How many are five and one?

LESSON VI.

1. Find a picture of some sheep. Try to draw something on your slate which will look like a sheep.

Has a sheep horns? fins? wings? feet? legs? How many horns? how many feet? how many eyes?

2. How many eyes have four lambs?

3. What is a lamb (*lăm*)?

4. What number is one more than five? Make five marks in a group, and then make another group of one more than five underneath the first group, and you will then see that six is one more than five; thus,
|||||
||||||.

5. What number is two more than seven? Illustrate with marks.

6. What number is five more than five? Illustrate.

7. What number is two more than eight?

8. What number is one less than six? Make a group of six marks, and then make another group of one less than six under the first group, and you will see that five is one less than six; thus,
||||||
|||||.

9. What number is one less than nine?

10. What number is three less than eight?

11. What number is four less than seven?

LESSON VII.

1. What number is one more than six?
2. What number is four more than five?
3. What number is two more than seven?
4. What number is one more than nine?
5. What number is one less than four?

6. What number is two less than five?

7. What number is three less than seven?

8. What number is three more than seven?

9. How many are two and two and three and one?

10. Find a picture of a horse. Of what are the shoes of a horse made? *Answer.* The shoes of a horse are made of iron.

11. Of what are your shoes made?

12. How many shoes does a horse have on his fore feet? how many shoes on his hind feet? how many on his four feet?

13. How many shoes must a span of horses have? A span of horses is two horses.

14. How many shoes does a child wear? Two shoes are called a pair of shoes.

15. How many shoes in two pairs?

16. How many shoes in three pairs? in four pairs? in five pairs?

LESSON VIII.

1. How many oxen in a yoke of oxen? in two yokes of oxen? in five yokes? in three yokes? in four yokes?

2. Two spans of horses are how many horses?

3. How many horses in five spans?

4. If Hannah can knit a mitten in two days, how long will it take her to knit a pair of mittens?

5. How many mittens are there in a pair? in three pairs? in two pairs? in five pairs?

6. If Hannah is one week knitting a sock, how long will it take her to knit a pair of socks?

7. When she has knit four socks which are alike, how many pairs will they make?

8. How many twos are there in four?

LESSON IX.

1. Twice two are how many? *Answer.* Twice two are four; || ||.

2. Twice three are how many? "Twice three" is the same as "three and three"; ||| |||.

3. How many are twice four? twice five? ||||| |||||.

4. How many days are there in a week?

5. How many Sundays are there in a week?

6. Joseph learns five verses in the Bible every Sunday; how many verses does he learn in two weeks?

7. Fannie learns only two verses each Sunday; how many does she learn in two weeks?

8. Twice five are how many? twice two? twice one?

9. Make marks showing that twice three are six; that twice two are four; that twice one are two; that twice five are ten; that twice four are eight.

10. Four is how many more than three? Make four marks in a group, and then make another group of three marks; and you will see that four is one more than three; thus, $\begin{matrix}||||\\|||\end{matrix}$.

11. Four is how many more than two? Illustrate.

12. Four is how many less than six? ||||
||||||.
Answer. Four is two less than six.

13. Eight is how many more than five? Illustrate.

14. Six is how many more than four? Illustrate.

15. Six is how many less than nine? Illustrate.

LESSON X.

1. Make marks showing that five and five are ten; that three and five are eight; that two and two are four; that three and three are six; that one and one are two.

2. Make marks showing that three and four and one and two are ten; that one and two and three and four are ten; that four and three and two and one are ten; that six and four are ten; that seven and three are ten; that eight and two are ten.

3. Horace has five books on the shelves and three on the table, and is reading one; how many books has he?

4. He is reading a story-book. He reads two chapters every evening; how many chapters does he read in four evenings? When he has finished his story his father has promised to buy him another book; how many books will he then have?

LESSON XI.

1. Add one and four and two; thus, one and four and two are seven.

2. Patrick has eight rabbits, and his sister Mary has two; how many rabbits have both? The children feed them twice every day; how many times are the rabbits fed in four days? Mary feeds them in the morning, and Patrick feeds then at night; how many times does Mary feed them in two days? in three days? in five days? in a week?

3. Patrick has also two broods of chickens; in one brood there are seven chickens, and in the other only three chickens; how many chickens has he?

4. Mary's pets are two canary birds, a mocking-bird, a kitten, and two ràbbits; how many pets has Mary?

LESSON XII.

1. How many days are there in a week?

2. Write the names of the days of the week, beginning with Sunday. Always write the days of the week with a capital for the first letter. Make a capital *m*; a capital *s*. Which is right, "Sunday" or "sunday"? "Monday" or "monday"? Make a capital *t*; a capital *w*; a capital *f*.

3. Frank had seven marbles, and his brother gave him three more; how many had he then? Frank lost all his marbles at play; how many had he then? *Answer.* He had none.

4. How many are six and three? five and four? seven and two? nine and one? five and three?

5. How many twos are there in six? I I,I I,I I.

LESSON XIII.

1. Three plus two equals how many? ***Answer.*** Three plus two equals five. Three and two are five. **I I I** and **I I** are five. Three plus two are five.

2. Twice four are how many? Illustrate with marks.

3. Five and five are how many? Illustrate with marks.

4. One plus one, plus two, equals how many?

5. Six plus four are how many? Illustrate.

6. Maggie picked five quarts of berries, and Anna picked four quarts; how many quarts did they both pick?

7. Lewis picked three quarts of berries one Saturday, four quarts the next Saturday, and three quarts the next Saturday; how many quarts did Lewis pick?

8. Once when Lewis went berrying he took his gun, and shot five gray squirrels and two red ones; how many squirrels did he shoot?

9. How many are three and five? two and six and one? three and three and one? five and three? seven and two? six and two? three and two? nine and one? eight and two? three and two?

* * *

LESSON XIV.

1. Eight plus one equals how many? nine plus one? seven plus one? six plus three? five plus four? four plus three? seven plus three? one plus one?

2. Mrs. Marsh bought four quarts of raspberries and three quarts of blueberries; how many quarts of berries did she buy?

3. Four plus three equals how many?

4. Five plus four are how many?

5. Three plus two plus one plus one are how many?

6. Marjorie's large wax doll has four silk dresses, three woolen dresses, and two print dresses; how many dresses has the doll? Marjorie made one of the silk dresses and all of the woolen dresses; how many dresses did Marjorie make? Her two other dolls have five dresses apiece; how many have both?

7. How many twos are there in eight? in ten? in four?

8. How many threes are there in nine? in six? Illustrate.

LESSON XV.

1. Four added to five equals how many? *Answer.* Four added to five equals nine.

2. Eight and one are how many? eight and two?

3. Six plus four equals how many? six plus three?

4. Three plus three plus one plus two equals how many?

5. How many are one and two and three and four?

6. Jennie received three Christmas cards, four New Year's cards, and two birthday cards; how

many cards did she get? She sent five Christmas cards and three New Year's cards; how many cards did she send?

7. Jennie had two birthday cards this year, two birthday cards last year, three the year before, and one the year before that; how many birthday cards has she had in all?

8. Take a few counters in your hand and tell at sight, that is, without counting them, how many you have.

9. Try to take up three at sight.

10. Try to take up five at sight; four at sight; two at sight.

11. Susan hemmed four handkerchiefs, and her mother hemmed five; how many did they both hem?

12. Four boys went down the hill on one sled, and four on another; how many boys went down the hill on both sleds?

13. Six plus four equals how many? three plus seven? nine plus one? eight plus two?

14. Three added to six equals how many?

15. Russell had four old ducks and six little ones. He sold all the little ones but one; how many did he sell? how many did he keep? how many ducks had he at first?

LESSON XVI.

1. What number is three more than five? Illustrate this and all the other questions in this lesson.

2. What number is one less than nine?

3. Ten is two more than what number?
4. Five is three more than what number?
5. Two is one less than what number?
6. Five is how many less than nine?
7. Eight is how many more than four?
8. Four is twice what number?
9. Make ten marks and cross off three at sight.
||||||| ~~|||~~.
10. Make ten marks and cross off five at sight.
11. What number is twice three?
12. What number is four less than eight?
13. Six is two less than how many?
14. How many are three less three?
15. What number is three times one?
16. What is one more than nine?
17. What is four less than seven?
18. How many more is seven than five?
19. How many less is five than ten?

◆

LESSON XVII.

1. Seven times one are how many?
2. How many more is ten than nine?
3. How many less is six than eight?
4. Katie Smith has three sisters and two brothers. How many brothers and sisters has she? How many more sisters than brothers has Katie? How many daughters has Mrs. Smith, Katie's mother? how many sons? how many more daughters than sons? How many children has she?

5. Two is how many less than three?

6. One and two and three are how many?

7. What number is one less than six?

8. How many more than four is nine? is ten? is eight?

9. Which is more, nine or ten? six or seven?

10. Which is most, two, four, or five? nine, four, or ten? three, four, or five?

LESSON XVIII.

1. Ten is how many more than one and one?

2. Eight is how many less than ten?

3. Eight is how many less than five and five?

4. Nine is how many threes? Illustrate with marks. | | | | | | | | |.

5. Nine is how many more than two threes? Illustrate.

6. Ten is how many fives?

7. Ten is how many twos?

8. Ten is how many more than two and two and two?

9. Ten is how many more than three twos?

10. Six is how many ones?

11. *Remember to write all the questions and the answers in full.*

12. Anna has two fans, Mattie has two, and Nettie has six. How many more has Nettie than Mattie? How many more has Nettie than Anna? How many have Anna and Mattie? How many have all the girls?

13. How many are six and two and two?

14. Try to take up six counters at sight.

15. Two is how many less than six?

LESSON XIX.

1. Three times two are how many? *Answer.* Three times two are six.

2. Make two marks three times; thus, || || ||.

3. Two and two and two are how many?

4. Three times three are how many? Make three marks three times.

5. How many are three and three and three?

6. How many are three threes?

7. How many are three twos?

8. Make two marks three times, and three marks twice.

9. Three times two are how many? twice three? "Twice three" and "three times two" are the same.

10. Make marks showing that three times two are six, and that twice three are six; thus,
|| || ||
||| |||.

11. Make marks showing that twice four are eight, and that four times two are eight.

12. How many are five and five? Illustrate with marks.

LESSON XX.

1. How many are twice three? Illustrate.

2. How many are three and three? Illustrate.

3. How many are three times two?

4. Make eight marks and cross off four at sight.

5. How many are two and four and one and two? Illustrate.

6. Herbert wrote four letters, and put one postage stamp on each letter. What will the stamps cost at two cents apiece?

7. Four times two are how many? twice four?

8. How many meals do we eat daily? "Daily" means "every day."

9. How many meals do we eat in two days? in three days?

10. How many are twice three? three times three?

LESSON XXI.

1. Four multiplied by two equals how many? *Answer.* Four multiplied by two equals eight. Illustrate. |||| ||||. *Your teacher will tell you the meaning of "multiplied by."*

2. Three added to five equals how many? Illustrate thus, ||||| |||.

3. Three multiplied by three equals how many? Illustrate.

4. Seven plus two equals how many?

5. Twice five are how many?

6. Three times three are how many? three times two? three times one? four times two? four times one?

7. Six plus three equals how many?

8. How many are twice two? twice five? twice four?

9. One Monday night little Jack's father brought him home a box of letter blocks. Tuesday Jack learned S and W; Wednesday he learned A; Thursday he learned O and H; Friday he learned I and Q; and Saturday he learned P for Papa, and J for Jack. How many letters did he learn the first week?

LESSON XXII.

1. Count ten forward and backward.

2. Edith stood at the window one day and counted all the birds that came to "see her," as she said. First one little humming-bird came to taste her flowers; then the two swallows which had a nest under the piazza came home; after that, four hungry English sparrows came looking for crumbs; and then a pretty robin-redbreast came and sang to her. How many birds did Edith count? How many birds were there before the robin came?

3. This robin has a mate and four little ones in an old apple-tree. How many robins live in the apple-tree?

4. A bad boy stole all the eggs from two sparrows' nests. Each nest had five eggs. How many bird's-nests did he rob? How many eggs did he steal?

5. Try to take up four counters at sight.

6. How many fives in ten?

7. How many twos in eight?

8. Ten is how many more than nine?

9. Eight marbles are how many more than one marble?

LESSON XXIII.

1. Make ten marks on your slate and wipe out one of them; thus, IIIIIIIII|.

2. One from ten leaves how many?

3. Ten is how many more than nine? *Answer.* Ten is one more than nine.

4. Make a group of nine marks; under this group make another of ten marks; and you will see that ten is one more than nine.

5. Nine is how many less than ten? *Answer.* Nine is one less than ten.

IIIIIIIIII
IIIIIIIII .

6. One from ten leaves how many? *Answer.* One from ten leaves nine.

7. Nine from ten leaves how many? *Answer.* Nine from ten leaves one.

8. Lena had ten little toy plates in her set of dishes. She lost one out of the window, and broke one; how many plates had she left? There were six cups and six saucers. Lena broke one of the cups; how many cups had she then? Her baby-brother broke two of the saucers; how many saucers were left?

9. Five children were at play with Lena when three more came; how many children were then at play together? One little girl had to go home at five o'clock; how many children were there after she went home?

10. Five and three are how many?

11. Five and three and one are how many?

12. Nine less one are how many?

13. Nine is one more than what number?
14. What number is one less than nine?
15. Eight is one more than how many?
16. What number added to five makes eight?

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LESSON XXIV.

1. One from nine leaves how many? one from six? one from two? one from seven? one from three? one from eight? one from four? one from five? one from ten? one from one? *Answer.* One from one leaves nothing.

2. May had six dolls before Christmas. At Christmas her auntie gave her a beautiful wax doll, and then May gave away two of her old dolls. How many dolls had she after giving away two? How many had she before she gave any away?

3. Nettie has knit nine times around her knitting work. Her stent is to knit around ten times. How many more times must she knit around to finish her stent?

4. Eight is how many more than seven?
5. Six is how many less than eight?
6. What number is one more than five?
7. What number is one less than six?
8. Two and what number are four?

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LESSON XXV.

1. Six is how many more than five?
2. Five is how many less than six?

3. Herman is ten years old and Richard is only five; how much older is Herman than Richard? How much younger is Richard than Herman? How old was Herman one year ago? *Answer.* Herman was nine years old one year ago. How old was Richard one year ago? two years ago?

4. If you had two pencils and your teacher should give you two more, how many would you then have? If you should lose one of the pencils, how many would you have?

LESSON XXVI.

1. John had five apples and gave three to his brothers; how many apples had he left?

2. He gave one of those he had left to his sister Florence; then how many had he?

3. John found nine seeds in his apple and Florence found eight seeds in hers. How many more seeds were in John's apple than in Florence's? John kept his seeds to snap at the cat which was asleep on the rug. He missed the cat four times; then he hit her once on her nose, and she ran away; how many seeds did John snap at the cat? How many seeds did John have left after the cat had gone? How many times did he hit kitty?

4. Four from seven leaves how many? three from six? five from nine? seven from ten? two from eight?

5. What number is two more than four?

6. What number is three more than seven?

7. What number is four more than four?
8. Take up five counters at sight.
9. Four and what number make seven?
10. What number is four less than eight?

* * *

LESSON XXVII.

1. Four is how many less than nine? Illustrate.

2. Ten is how many more than five? than eight? than six? than one? than four? than three? than two? than seven? than nine?

3. Eight is how many less than ten? than nine?

4. What number is twice as large as two? *Answer.* Four is twice as large as two. Illustrate with marks.

5. What number is twice as large as three? as five? as four?

6. Twice two are how many? Illustrate with marks.

7. How many are twice five? twice four? twice one?

8. How many are two and four and one and two? Illustrate with marks; thus, I I I I I I I I I, and with counters.

9. What do you use for counters? Some children use beans, some use nuts, some use grains of barley, and some use small cubes, and others use other small objects.

10. Five taken from six leaves how many?

11. Leonard left five books lying on the table; Mary put four of them in the bookcase; how many

were left on the table? All the books except two were picture books; how many picture books were there? Leonard had put new covers on all of them but one; how many had he covered?

12. Leonard has a set of ten "Rollo" books. He has covered five of them; how many are not covered?

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LESSON XXVIII.

1. Three little boys had each three marbles. Willie, one of the boys, lost all of his marbles from his pocket; how many marbles were left for the boys to play with? How many marbles had all of the boys before Willie lost his? How many marbles were lost?

2. Nine is how many more than six? Illustrate.

3. Six from ten leaves how many? six from eight? six from seven?

4. There were nine little boys in Miss Cole's Sunday-school class. She gave a Sunday-school book to each of them except little George, who was too young to read. How many books did Miss Cole give her class? One Sunday last summer two of the boys were ill, and two were gone to the sea-shore; how many were absent from Miss Cole's class? How many were present at Sunday school? Each of the five boys present recited two verses from the Bible; how many verses did they recite?

5. Four from eight leaves how many?

6. *Write all questions and their answers in full.*

LESSON XXIX.

1. Five from eight leaves how many? three from eight? two from eight? seven from eight? six from eight? one from eight? four from eight? eight from eight? nothing from eight?

2. How many are three and six and one?

3. Four and four are how many?

4. Five multiplied by two are how many?

5. How many are twice four? twice five? twice three? twice one? twice two?

6. Carrie painted seven pictures and gave them all away but two; how many did she give away?

7. Asa has learned ten pages of his history and Irving has learned only five; how many more pages has Asa learned than Irving?

8. Ten are how many more than five?

9. Five is how many less than ten?

10. How many fives are there in ten?

LESSON XXX.

1. Alice takes two music lessons a week; how many lessons does she take in four weeks?

2. How many are two and two and two and two?

3. Oliver's father gives him four cents a day for doing errands; how many cents does Oliver earn in two days?

4. Oliver spent two cents for a top-string the first day he did errands for money; how many cents did he have left?

5. Two subtracted from four leaves how many?

6. Seven minus four equals how many? "Minus" means less.

7. Aunt Kate bought drums for her nephews, Ned, Tom, and Jack. Each drum had two drum-sticks; how many drum-sticks had all the drums?

8. How many postal cards can be bought for a dime (a ten-cent piece)?

9. How many more postal cards can be bought for a dime than for a five-cent piece?

10. Harry's boat has three oars on each side; how many men can row if there is one man to each oar?

11. Henry's boat has only one oar on each side. How many oars must he use to row his boat alone? If Henry takes Fred and James into his boat, how many of the boys can row at a time? If one of the boys rows with both oars, how many boys will there be in the boat who are not rowing?

LESSON XXXI.

1. Ten less eight equals how many? Ten less six leaves how many?

2. Five plus five equals how many?

3. Five and four are how many?

4. Three from eight leaves how many?

5. One added to seven equals how many?

6. One subtracted from seven leaves how many? *Answer.* One subtracted from seven leaves six.

7. Three times two are how many? three times three? three times one?

8. Miss White's bookcase has a lock on the door, one on the writing-desk, one on each of three large drawers, and one on each of two small drawers. How many locks are there on the bookcase?

9. A little Italian boy had ten red toy balloons for sale on the Fair Ground. He sold them all but one; how many did he sell? Katie's mother bought one for Katie and one for her brother Tim, at five cents apiece; how much did both balloons cost?

10. Watson got five rewards of merit in one week, and his brother Sam got only three; how many did they both get? How many more did Watson get than Sam? How many less did Sam get than Watson?

LESSON XXXII.

1. Four multiplied by two equals how many?

2. Add four and five; three and two; six and four; eight and one; seven and three; one and nine.

3. Three threes are how many? Illustrate.

4. Make seven marks, and cut off four at sight.

5. Subtract two from six; thus, two from six leaves four.

6. John's top cost nine cents, and the string cost one cent; how much did both cost?

7. Eddie carried six sweet apples to school and gave them all away but one; how many did he give away? How many did he keep for himself?

8. James saw "Punch and Judy" twice when he was in Boston, once in Chicago, and four times at

home. How many times has he seen "Punch and Judy"?

9. Susie's auntie gave her two toy flat-irons, five clothes-pins, a wash-tub, and a wringer. The flat-irons cost eight cents apiece; the clothes-pins cost two cents; the wash-tub nine cents; and the wringer ten cents. How much more did the wash-tub cost than the clothes-pins? How much more did the wringer cost than one flat-iron? How much less did one flat-iron cost than the wash-tub? Draw a picture of a wash-tub, of a flat-iron, and of a clothes-pin.

LESSON XXXIII.

1. Subtract three from ten; one from six; two from five; three from seven; five from nine; nine from nine; two from nine; four from nine.

2. Two and three and four less seven are how many?

3. Six and four minus one equal how many?

4. How many are one and two and three and four less five?

5. How many are four and three and two and one less five?

6. Mrs. Walker had nine geranium plants standing on the piazza, and the frost killed all but three of them; how many more were killed than were uninjured? How many less were not killed than were killed? How many more plants must Mrs. Walker get to have ten?

7. James gave Charlie five fish-hooks and had five

left; how many had James before he gave any away?

8. Make seven marks and cut off five at sight.

9. Five less five are how many?

10. It rained two days and snowed two days in one week; the other days were pleasant. How many pleasant days in that week?

LESSON XXXIV.

1. Nine less six equals how many?

2. Make five marks on your slate and tell how many more you must make to have six marks.

3. Take five counters in your hand and tell how many more you must take to have six counters.

4. What number added to five makes six?

5. What number added to five makes ten?

6. What number added to six gives eight?

7. Ten is how many more than nine?

8. What number is one more than nine?

9. What number must be subtracted from ten to leave nine? Take ten counters in your hand and tell how many you must lay down to leave nine in your hand?

10. Take nine from ten; six from eight; eight from nine.

11. Three and three are how many? two and two? four and four? one and one? five and five?

12. What will three pairs of skates cost at two dollars a pair?

LESSON XXXV.

1. Julia threw down her knitting work very carelessly and dropped seven stitches; she picked them all up but one, which ran down so far she had to ask her sister to take it up for her. How many stitches did she pick up herself?

2. When Oscar went out to fly his kite the kite had ten bobs, but the tail caught in a tree and three bobs were broken off. How many bobs were left when Oscar pulled in his kite?

3. Draw a kite with ten bobs on the tail.

4. Do you think you could draw a picture of a little boy flying his kite?

5. How many more fingers than thumbs have you?

LESSON XXXVI.

1. Nine minus five equals how many?

2. Count backward from ten to one; thus, ten, nine, eight, etc. Ask your teacher what "etc." means.

3. Count backward from eight to three.

4. What number subtracted from ten leaves eight?

5. What number multiplied by two gets four? Illustrate with marks. || ||.

6. What number added to five gives ten? Illustrate thus, ||||| |||||.

7. Molly has three worsted needles and Kate has only one; how many more worsted needles has Molly than Kate? How many needles have both? If Kate's

mother should give her two more, how many would she then have? How many would she have if she should break one? How many more would Molly have than Kate after Kate had broken one?

8. The girls made lamp-mats for the fair. Molly made one in four days, but Kate was seven days making hers; how much longer was Kate than Molly in making a lamp-mat?

LESSON XXXVII.

1. Eight divided by four equals how many? *Answer.* Eight divided by four equals two; thus, I I I I,I I I I.

2. Robert's eight turkeys strayed off into the woods and he could find only seven of them; how many were lost?

3. Make four marks on your slate and divide them into groups of two each; thus, I I,I I.

4. How many twos are there in four?

5. How many twos are there in eight? I I,I I,I I,I I.

6. Make six marks on your slate and divide them into groups of two each.

7. How many twos in six?

8. Make six marks on your slate and divide them into groups of three each, and tell how many threes there are in six.

9. A fox caught two chickens from a brood of ten, and a hawk flew off with another; how many chickens were left in the brood?

LESSON XXXVIII.

1. How many threes are there in nine? Illustrate.

2. How many twos are there in ten? in eight? in four? in two?

3. Lou had nine peaches which she gave to her three brothers. She divided them equally; how many did she give to each brother?

4. Nine divided by three equals how many?

5. Ned's father gave him ten cents and sent him to the post-office for two-cent postage stamps. How many stamps could Ned get with the money? How many twos in ten?

6. Two will go in ten how many times?

7. Take ten counters in your hand and tell how many twos you have; how many fives.

8. Mrs. Brown gave eight toys to some children, giving them two toys apiece. To how many children did she give the eight toys? *Answer.* She gave the eight toys to four children.

9. If Mrs. Brown had given all the toys to two children, how many would each child have had?

10. Write the names of some of your toys.

11. Draw pictures of four of your toys.

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LESSON XXXIX.

1. Three will go in nine how many times? Three in six? Three in three? *Answer.* Three will go in three once.

2. Two in two how many times? Five in five? Four in four?

3. Make nine marks on your slate and cut off three at sight.

4. Six and what number are ten?

5. Two in eight how many times?

6. Five divided by five equals how many? *Answer.* Five divided by five equals one.

7. Five in five how many times? *Answer.* Five in five once.

8. Helena's hat cost three dollars before it was trimmed; the feathers cost four dollars; the ribbon one dollar; the other trimmings one dollar; and the work one dollar. What was the whole cost of the hat?

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LESSON XL.

1. Nine divided by three equals how many? Illustrate with marks.

2. How many are three and three and three?

3. Georgie's coat has ten buttons down the front, in two rows; how many buttons in each row? His jacket has four buttons on the front, and two buttons each on the two pockets; how many buttons on his jacket? How many more buttons on Georgie's coat than on his jacket?

4. Make ten marks on your slate and wipe out enough to leave six, and tell how many you wiped out, or *erased*.

5. How many are subtracted from ten to leave six?

6. Four boys went fishing with two fish-hooks apiece; how many fish-hooks did they all have? How many fish-hooks had each boy? A big fish broke one of the lines and carried off the hook, another hook was broken, and two more hooks were lost; how many hooks did the boys have left? How many did they lose? They had each a fish-pole; how many poles had they?

7. One boy got three fish, another got four fish, and another got only one, while the boy whose line was broken did not get any; how many fish did they all get? They divided their fish equally between two poor old women; how many fish did they give each woman?

LESSON XLI.

1. How much is eight less eight? *Answer.* Eight less eight is nothing.

2. How many twos are there in five? *Answer.* In five there are two twos and one over.

3. Make five marks on your slate and divide them into groups of twos; thus, I I,I I,I.

4. Two will go in five how many times? *Answer.* Two will go in five twice and one over.

5. How many twos are there in seven? Illustrate with marks; in nine? in five? in three?

6. Two in nine how many times? Illustrate with marks.

7. Four in six how many times? Illustrate.

8. Four in ten how many times? three in seven?

six in ten? four in nine? four in eight? two in seven? two in nine? two in eight? one in six? one in seven? two in three? one in two?

9. How many oranges at five cents apiece can you buy for ten cents? If you should lose one cent, how many oranges could you then buy? *Answer.* I could buy only one orange, and I should have four cents left.

10. If the oranges were only three cents apiece, how many oranges could you buy for ten cents? If they were four cents apiece, how many could you buy for ten cents? How much would you have left? How many lemons at two cents apiece could you buy with the money which you had left?

11. Michael got four crayons from the box of chalk in the closet, but before he reached the slate he dropped one crayon which broke into three pieces; how many pieces of chalk had he then?

12. Hugh saw five wild ducks at the lake and shot all but one of them; how many did he shoot?

LESSON XLII.

1. Ten divided by two equals how many? seven divided by one? eight divided by four? six divided by three?

2. How many must be added to each of the following to make ten: one? *Answer.* Nine must be added to one to make ten. Six? four? two? eight? three? nine? seven? five?

3. Take four counters, holding an equal number in each hand. You have one-half of four in each hand.

4. What is one-half of four? one-half of six? one-half of ten? one-half of two? one-half of eight? Illustrate with counters.

LESSON XLIII.

1. Five is one-half what number? Illustrate all the questions in this lesson.
2. Ten is twice what number?
3. What number is twice four?
4. What number is five more than five?
5. What number is five less than eight?
6. Four is three less than what number?
7. Nine is four more than what number?
8. Six is two less than how many?
9. What number is three times three?
10. Ten is four more than how many?
11. Eight is two less than what number?
12. What is one more than eight?
13. What is four more than five?
14. Jennie had four quill pens and Harry had two more than Jennie; how many pens had Harry? How many had both? How many less had Jennie than Harry?
15. Which is the most, seven, five, or ten?
16. How many more is seven than five?
17. How many less is five than ten?
18. Make nine marks and cut off four without counting them.

19. How many less than seven is five?
20. How many more is ten than seven?
21. How many more than five is ten?
22. Five is how many less than seven?
23. Five is how many less than ten?

LESSON XLIV.

1. How many more is nine than seven? Illustrate.
2. What number is one-half of eight?
3. Four is one-half of what number?
4. What is three more than seven?
5. Six is four less than how many?
6. Seven is two less than what number?
7. What number is three more than five?
8. What is three times two?
9. Seven times one are how many?
10. Once seven is how many?
11. What number is one-half of eight?
12. Twice five is one more than what number?
13. Six and three are one more than what number?
14. Which is most, seven, ten, or one?
15. Which is least, seven, ten, or one?
16. How much more is ten than seven?
17. How many less than ten is one?
18. Give all the pairs of numbers which make six.
19. How many more than one is seven?
20. How much more than one is ten?
21. Ten is how many more than seven?
22. Seven is how many more than one?

23. Seven is how many less than ten?
24. One is how many less than seven? than ten?
25. Ten is how many more than one?
26. How many more is ten than one?
27. How many more is seven than one?
28. How many less is one than ten?
29. How many less is one than seven?
30. How many more than one is seven?

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LESSON XLV.

1. Jane has ten pencils and Mary has only two. How many more pencils has Jane than Mary?

2. What .will two umbrellas cost at five dollars apiece?

3. If a pair of rubber boots cost two dollars, and a pair of leather boots cost four dollars, how much more do the leather boots cost than the rubber boots?

4. Tommy has ten chickens and seven ducks. How many more chickens than ducks has he?

5. How many more feet has a colt than a hen?

6. Paul has caught seven fish. How many more must he catch to have ten?

7. John has eight sticks of candy. To how many boys can he give two sticks each and have two left for himself?

SECTION II.—NUMBERS FROM ONE TO TWENTY-FIVE.

LESSON I.

1. The following are the figures from one to twenty-five: —

NAMES.	FIGURES.	NAMES.	FIGURES.
Naught or zero	0	Thirteen	13
One	1	Fourteen	14
Two	2	Fifteen	15
Three	3	Sixteen	16
Four	4	Seventeen	17
Five	5	Eighteen	18
Six	6	Nineteen	19
Seven	7	Twenty	20
Eight	8	Twenty-one	21
Nine	9	Twenty-two	22
Ten	10	Twenty-three	23
Eleven	11	Twenty-four	24
Twelve	12	Twenty-five	25

LESSON II.

1. Make 12 marks on your slate.
2. Make 20 marks.
3. Make 17 marks.
4. Make 14 marks; 21 marks; 25 marks; 19 marks.
5. Show that 10 and 1 are 11; thus, |||||||||| |.

6. Show that 10 and 2 are 12; that 10 and 10 are 20.

7. Show that 10 and 5 are 15; that 10 and 7 are 17. Illustrate the following: —

8. How many are 3 and 3?

9. How many are 6 and 4? 5 and 5? 8 and 2? 7 and 1? 5 and 4? 9 and 1?

10. Count backward from 10 to 1.

11. Count from 11 to 20.

12. Count backward from 20 to 11.

13. Show by marks that 2 and 2 and 2 and 3 are 9.

14. Show that 10 and 7 are 17.

15. How many are 10 and 4? Illustrate.

16. How many are 10 and 9? 10 and 2? 10 and 1?

17. 1 from 6 leaves how many? 2 from 7? 5 from 10? 4 from 8? 3 from 6? 7 from 10? 3 from 8? 2 from 9? 1 from 10? 5 from 9? 6 from 10?

18. How many are 4 plus 4? 5 plus 5? 3 plus 3? 2 plus 2? 1 plus 1?

19. 10 less 3 are how many? 9 less 3? 6 less 2? 5 less 1?

20. How many are 5 and 5? 6 and 6? 7 and 7? 8 and 8? 9 and 9? 10 and 10? 11 and 11? 12 and 12? Illustrate.

21. If Sammie has 15 marbles and Frankie has only 4, how many more marbles has Sammie than Frankie? After Frankie has won ten marbles from Sammie, how many marbles will each have? Who will then have the most? How many more will Frankie have than Sammie?

22. What is one-half of 4?

LESSON III.

1. What is one-half of 10? Make ten marks on your slate and divide them into two equal groups. Each group is one-half of ten. How many are there in each group?

2. Make 2 groups of marks, one in one group and one in the other, until you have made 12 marks in all; each group is one-half of 12 marks |||||| ||||||.

3. What is one-half of 12?

4. Make 14 marks in two equal groups.

5. What is one-half of 14?

6. What is one-half of 16? Illustrate.

7. What is one-half of 18? Illustrate.

8. What is one-half of 20? Illustrate.

9. Write the figures from 1 to 12 in a column, and multiply each by 2; thus,

Twice 1 are 2
Twice 2 are 4
Twice 3 are 6
Twice 4 are 8
Twice 5 are
Twice 6 are etc.

What is one-half of 24?

10. Georgie's jack-knife has four blades, and his pen-knife has one blade; how many blades have both knives? How many blades in three jack-knives and one pen-knife? How many blades in four jack-knives?

11. How many are 4 and 4 and 4 and 1?

12. How many are 4 and 4 and 4 and 4?

13. 4 times 4 are how many?

14. Mary had 15 peaches and gave 3 of them to

Harry, and 3 to her mother; how many had she left? How many more had she than Harry? How many more than her mother?

LESSON IV.

1. $+$ is the sign plus, and means "added to" or "and."

2. $-$ is the sign minus, and means "less."

3. $\times$ is the sign of multiplication, and means "multiplied by" or "times."

4. $\div$ is the sign of division, and means "divided by."

5. $=$ is the sign of equality, and means "equals."

6. Make the sign of addition.

7. Make the sign of subtraction.

8. Write the words $9 + 9 = 18$; thus, Nine plus nine equals eighteen.

9. Write in words:

$12 + 12 = 24.$ $5 + 5 = 10.$ $10 + 10 = 20.$
$7 + 7 = 14.$ $11 + 11 = 22.$ $4 + 4 = 8.$
$6 + 6 = 12.$ $8 + 8 = 16.$ $1 + 1 = 2.$

10. Write in words: $12 - 10 = 2$; thus, Twelve minus ten equals two.

11. Write in words:

$12 - 6 = 6.$ $15 - 9 = 6.$ $24 - 20 = 4.$
$14 - 10 = 4.$ $18 - 9 = 9.$ $17 - 10 = 7.$
$11 - 5 = 6.$ $20 - 10 = 10.$ $18 - 10 = 8.$

12. Write in words $4 \times 4 = 16$; thus, Four times four equals sixteen.

13. Write in words: $3 \times 3 = 9$. $2 \times 2 = 4$ (Twice two are four).

$5 \times 5 = 25$.
$3 \times 5 = 15$.
$4 \times 5 = 20$.
$4 \times 3 = 12$.
$4 \times 6 = 24$.
$3 \times 7 = 21$.
$10 \times 2 = 20$.
$2 \times 10 = 20$.
$2 \times 11 = 22$.

14. Write in words: $12 \div 3 = 4$; thus, Twelve divided by three equals four.

15. Write in words:

$16 \div 2 = 8$.
$16 \div 8 = 2$.
$15 \div 3 = 5$.
$20 \div 4 = 5$.
$20 \div 2 = 10$.
$20 \div 10 = 2$.
$14 \div 2 = 7$.
$18 \div 3 = 6$.
$18 \div 6 = 3$.

16. Write in figures and signs, Eight times two are sixteen. Three times four are twelve. Twice nine are eighteen.

17. If 10 marbles can be bought for 1 cent, and you give a ten-cent piece for 10 marbles, what change will you get? If you then buy a banana for 5 cents, how much money will you have left?

LESSON V.

1. Make the sign of subtraction.

2. Make the sign of addition; of division; of multiplication; of equality.

3. Write in figures and signs, Fifteen minus five equals ten; thus, $15 - 5 = 10$. Ten and ten are twenty. Seven from fourteen leaves seven. Four times six are twenty-four. Ten and seven are seventeen. Ten and four are fourteen. Ten and nine are nineteen. Twenty divided by two equals ten.

Twenty divided by four equals five. Three multiplied by seven equals twenty-one. Four multiplied by five equals twenty. Four and ten are fourteen. Eighteen less eight equals ten. Five from twenty-five leaves twenty. Four in twelve three times. Six in eighteen three times. Six added to six equals twelve. Nine subtracted from eighteen leaves nine. Five multiplied by five equals twenty-five. Four in twenty-four six times.

4. One and four are five; two and three are five; three and two are five; four and one are five. In this way give all the pairs of numbers which make six.

5. Give all the pairs of numbers which make seven; which make four; which make eight.

LESSON VI.

1. Mr. Daily drove his horse 5 miles an hour for 4 hours; how many miles did the horse travel? How far did he travel in 2 hours? in 3 hours? in 5 hours?

2. If a trunk cost 8 dollars, a hand-bag 6 dollars, and a shawl-strap 2 dollars, how much did they all cost? Which cost the most? How much more did the trunk cost than the other two articles? How much more did the bag cost than the strap?

3. If a class of 12 children have each two slates, how many slates has the class? If 6 of the boys should break each one slate, how many slates would e left? How many would be broken?

4. Nettie picked up 20 autumn leaves, but threw away 5 of them; how many did she keep?

5. Nettie's grandfather had a flock of 30 sheep and lambs in the pasture on the mountain; but the bears caught 4 of the sheep, 2 lambs strayed away and were lost, and Nettie's uncle Oscar killed 3 of the lambs to eat. How many of the flock were left?

LESSON VII.

1. Add 6 and 6, using the sign of addition and equality.

2. Add 6 and 4; 10 and 9; 12 and 12; 9 and 9; 8 and 8.

3. Subtract 5 from 12, using the signs; 9 from 18; 10 from 20; 10 from 16; 10 from 12; 10 from 17.

4. Multiply 2 by 2, using the signs; 3 by 3; 4 by 4; 5 by 5; 5 by 2; 6 by 2; 7 by 2; 8 by 2; 9 by 2.

5. Divide 10 by 2, using the signs; 12 by 3; 16 by 4; 20 by 4; 25 by 5; 18 by 2; 16 by 2; 22 by 11.

6. How many are 12 — 12? Write these answers in words; thus, Twelve minus twelve equals nothing. And in figures; thus,

$12 - 12 = 0$	$7 + 7$?	$8 - 8$?
$13 - 3$?	$15 \div 3$?	$9 + 9$?
$9 - 6$?	$12 \div 4$?	5×5?

7. How many more days are there in 3 weeks than in 2 weeks?

LESSON VIII.

1. How many more is 15 than 10?
2. How many less is 18 than 23?
3. What number is 7 more than 11?
4. What number is one-half of 24?
5. What number is 11 less than 23?
6. 25 is how many more than 15?
7. What is 6 less than 18?
8. 10 is how many less than 12?
9. Twice 16 are how many?
10. Give all the pairs of numbers which make ten.
11. How many are 17 and 17?
12. To what is 10 added to make 20?
13. What number added to itself makes 10?
14. Take ten counters and place them, one at a time, in two groups, 1 in one group and 1 in the other, alternately, until you have placed all the 10 counters in the two groups. Each group has the same number, which is 5; and 5 added to itself makes 10.

15. Illustrate the same with marks, making 1 mark at a time, alternately, in two groups, until you have made 10 in all.

16. What number added to itself makes 12? Illustrate with counters and with marks.

17. What number added to itself makes 20? makes 18? makes 8?

18. Count 25 forward and backward.

19. How much more will 3 bananas cost at 5 cents apiece than at 4 cents apiece?

LESSON IX.

1. By what is 10 multiplied to get 20?

2. By what is 11 multiplied to get 22?

3. By what is 5 multiplied to get 10?

4. A number is doubled when multiplied by 2.

5. A number is doubled when it is taken twice.

6. A number is doubled when it is added to itself.

7. How many are 6 and 6? What number have you doubled? *Answer.* I have doubled 6.

8. How many are 9 and 9? What number have you doubled?

9. How many are twice 11? What number have you doubled?

10. Twice 12 are 24. What number is doubled? *Answer.* Twelve is doubled.

11. Twice 4 are 8. What number is doubled?

12. 10 and 10 are 20. What number is doubled?

13. $7 + 7 = 14$. What number is doubled?

14. $12 + 12 = 24$. What number is doubled?

15. $8 + 8 = 16$. What number is doubled?

16. Double 4; thus, $4 + 4 = 8$.

17. Double 12; 8; 10; 6; 7; 4; 2; 3; 9; 7; 11; 1.

18. How is a number doubled? *Answer.* A number is doubled by adding it to itself.

19. What will 2 camelias cost at 5 cents apiece? If rose-buds cost double what camelias cost, what will you have to pay for 2 rose-buds? What will you have to pay for 1 rose-bud? for 1 camelia and 1 rose-bud? for 2 camelias and 1 rose-bud?

20. Write all the pairs of numbers which make 12.

LESSON X.

1. What number is one-half of 20?
2. What is 3 times as much as 5?
3. 25 is 5 more than what number?
4. 20 is 4 times what number?
5. 3 times what number is 15?
6. What number added to 15 gives 20?
7. 20 is how many more than 18?
8. What number is 8 less than 24?
9. 25 — 10 equals how many?
10. How many more is 19 than 15?
11. 19 is how many more than 15?
12. 15 is how many less than 19?
13. How many less than 19 is 15?

14. Miss Ames mailed 5 letters. They were all over-weight and required double postage. How much will the postage cost?

15. What does "over-weight" mean?

16. Mrs. Clay found in Carrol's pocket a knife, a fish-line, a lead-pencil, a piece of rubber, a string, a two-cent piece, a top, 2 shoe-buttons, and 6 marbles. How many things had Carrol in his pocket?

17. Make 10 marks, and cross off half of them at sight.

LESSON XI.

1. Double 4; 8; 12; 6; 3; 9; 11; 2; 10; 7; 1; 5.

2. What is one-half of 8? of 10? of 20? of 16? of 24? of 4? of 2? of 6? of 14? of 22? of 18? of 12?

3. Hugh went to walk in the country, and picked 24 wild pinks in a wheatfield. He gave half of them to his mother and carried the rest to his teacher. How many did he give to his teacher? How many did his mother have? His teacher left half of hers in the school-room for the next day and took half of them home; how many did she carry home? His mother put hers in two small glass vases, an equal number in each vase; how many did she put in one vase?

4. Hugh saw a flock of sheep and lambs in a pasture while he was gone. The lambs were nearly as large as the sheep. They were afraid of him, and ran away over a low stone-wall. He counted them as they went over the wall, and made 22. Half of them were old sheep and half of them were lambs. If Hugh did not make a mistake in counting, how many lambs were in the flock?

5. What is one-half of 22? How many are twice 11?

6. What is one-half of 24? How many are 12 and 12?

7. What is one-half of 18? $9 + 9 =$ how many?

8. What is one-half of 16? $8 + 8 =$ how many?

9. Double 7. Illustrate with marks and with counters.

10. What number added to itself gives 16?

11. Carrie painted 4 paper dolls for Nettie, 4 for

Lena, 3 for her cousin Fannie, and 3 for herself, and enough more for the Fair to make 18 in all. How many did she paint for the Fair?

* * *

LESSON XII.

1. Count backward from 25 to 15 inclusive.

"Inclusive" means counting both the 25 and the 15.

2. 20 from 25 leaves how many? 5 from 25? 10 from 25? 10 from 20? 10 from 17?

3. Use counters for these examples, if you wish. 15 less 5 equals how many?

4. How many are 19 less 9?

5. 8 from 16 leaves how many?

6. $12 - 6 =$ how many?

7. Charles bought 20 pens at a cent apiece. He used half of them in copying his Geography and History Questions; how many pens did he use? How many pens had he left? He gave his brother William one-half of those he had left; how many pens did he give William? How many cents' worth of pens did he use in his copying? How many cents' worth did he give his brother? How many cents' worth did he have left? One pen will last Charles a fortnight, which is two weeks. How long will the 5 pens he has left last? William does not write as much as Charles, and his pens will last twice as long. How long will William's 5 pens last?

8. Write the numbers from 11 to 25 in a column, and subtract 10 from each, using the signs; thus,

$$11 - 10 = 1.$$
$$12 - 10 = 2.$$
$$13 - 10 = 3.$$

etc.

LESSON XIII.

1. What number subtracted from 17 leaves 10? *Answer.* 7 subtracted from 17 leaves 10. Illustrate with counters.

2. What number subtracted from 16 leaves 10? Illustrate.

3. What number subtracted from 14 leaves 10?

4. What number subtracted from 12 leaves 10?

5. What number subtracted from 18 leaves 10?

6. How many are 5 and 5 and 5 and 5 and 5?

7. Multiply 5 by 5; thus, $5 \times 5 = 25$.

8. Multiply 10 by 2.

4 by 4.
3 by 3.
2 by 2.
5 by 2.
6 by 2.
4 by 5.
5 by 3.
3 by 4.
3 by 6.
6 by 4.
9 by 2.
6 by 3.

9. What is one-half of 12?

10. Double 12.

11. On Nannie's twelfth birthday, her father bought her a box of beautiful flowers containing twelve exquisite tea rose-buds. Her mother made her a birthday cake with a large "N" of sugar-sand in the frosting, and put as many candles around it as

Nannie was years old. How many candles were placed around the cake? After supper Nannie wanted to take half of the rose-buds to poor Phebe, one of her school-mates, who was very ill. How many rose-buds did Nannie give Phebe? How many did she keep?

12. What is one-half of 12? of 14? of 24? of 20? of 16?

13. Divide 16 by 2; thus, $16 \div 2 = 8$.

14. Divide 18 by 2; 20 by 2; 14 by 2; 16 by 2; 12 by 2.

15. What number is 10 more than 11?

16. What number is 9 more than 10?

17. What number is five less than twelve? 4 less than 13?

18. What number is six less than thirteen?

LESSON XIV.

1. What number must be added to 10 to make 13? Illustrate.

2. What number must be added to 10 to make 19?

3. What number must be added to 10 to make 16?

4. Mrs. Lyon was very much troubled with mice in her store-room, and she told Heman, the hired man, that she would give him one dollar when he had caught 25 mice. He set a trap, and caught 2 mice the first night; then he got another mouse-trap, and set two traps the second night, and caught 3 mice in each trap; the third night he caught 4 mice in one trap and none in the other; the fourth night he caught only 1 mouse; the fifth night he caught 4 mice. How many more must he catch before he has 25?

5. Fill out the following:

7 +   = 10.
9 +   = 10.
2 +   = 10.
6 +   = 10.
4 +   = 10.
8 +   = 10.
1 +   = 10.
3 +   = 10.
5 +   = 10.

6. What number added to 7 makes 10?

7. What number subtracted from 12 leaves 8?

8. What number was doubled to get 20?

9. What number is multiplied by 2 to make 20?

10. What number is divided by 3 to get 3?

11. Emma bought 2 collars at 10 cents apiece and a spool of silk for 5 cents; how much did she pay for all?

12. Emma, Kate, Fan, and Lilian had new hats which cost 5 dollars apiece; how much did they all cost?

13. There are 24 buttons on two pairs of Helen's gloves. How many buttons on each pair? How many buttons on each glove?

* * *

LESSON XV.

1. Subtract 10 from 20; thus, $20 - 10 = 10$.

2. Subtract 10 from 12.

10 from 17.
10 from 16.
10 from 11.
10 from 14.
10 from 21.
10 from 22.
10 from 23.
10 from 24.
10 from 19.

3. 20 minus 8 equals how many?

4. 20 minus 12 equals how many? 8 and 12 are how many?

5. How many are twice 8? 8 times 2? 4 times 4?

6. Fill out the following:

8 × = 16. 2 × = 12. 2 × = 20.
2 × = 16. 3 × = 12. 4 × = 20.
4 × = 16. 4 × = 12. 5 × = 20.
1 × = 16. 6 × = 12. 10 × = 20.

7. Sammie caught 5 trout on Monday and 8 on Tuesday; Wednesday he did not go fishing; Thursday he caught 7; Friday, none; and Saturday, 2. His mother cooked them all but 4, which Sammie gave to his grandmother. How many did Mrs. Boothby, Sammie's mother, cook in a week? How many did Sammie catch? He went fishing twice the next week and got just one-half as many as he got the first week; how many fish did Sammie catch the second week? The third week he went three times and got double the number he caught the second week; how many fish did he catch the third week? How many the second week? How many the first week?

8. Did you ever see a trout? Draw a fish.

9. Write the names of all the fish you can remember.

10. How many must you add to each of the following numbers to get 20? 8. 12. 15. 9. 2. 1. 7. 6. 14. 19.

11. Give all the pairs of numbers which make 8.

12. Make 8 marks, and cross off half of them at sight.

LESSON XVI.

1. Multiply 12 by 2; thus, 12 × 2 = 24.

2. Multiply:

2 by 2. 11 by 2. 5 by 2. 7 by 2.
9 by 2. 6 by 2. 3 by 2. 1 by 2.
8 by 2. 4 by 2. 10 by 2.

3. 3 times 1 are how many? Illustrate.

4. 3 times 2 are how many?

5. 3 times 3 are how many?

6. 3 times 4 are how many?

7. 3 times 5 are how many?

8. 3 times 6 are how many?

9. 3 times 7 are how many?

10. 3 times 8 are how many?

11. Count by 3's from 3 to 24; thus, 3, 6, 9, 12, 15, 18, 21, 24.

12. Count by 2's from 2 to 24.

13. Carrie cut 2 roses from her June rose-bush every morning while it was in blossom, except Sundays, when she cut double the number that she did on week-days. How many roses did she cut in 1 week? One-half of the roses which she cut Sunday mornings she carried to an old lady who was too feeble to take care of plants for herself. The roses remained in bloom 6 weeks. How many did Carrie give the old lady? How many did she give her every Sunday?

14. Find a picture of a wild rose, and count its petals.

15. All roses, except wild roses, have a great many petals, but a pansy has only five petals. How many petals have 5 pansies? What other flowers can you name which have only 5 petals? What flowers can you name which have more than 5 petals?

16. Are you older or younger than your mother?

17. How can you find the difference in your ages?

LESSON XVII.

1. Write the numbers from 1 to 12 in a column, and multiply each by 2; thus,

$$1 \times 2 = 2.$$
$$2 \times 2 = 4.$$
$$3 \times 2 = 6.$$

etc.

2. Write the multiplication table of 3's, as far as 8 times 3, in the same way.

3. What number added to itself makes 12?

4. Lottie had 2 ten-cent pieces. She paid 15 cents for some knitting-cotton, and 4 cents for a set of knitting-needles; how much change did she get?

5. Of what is a ten-cent piece made?

6. Have you one in your pocket-book? If not, ask your teacher to lend you one, and see how nearly you can draw the side stamped "*One dime.*"

7. How many knitting-needles make a set?

8. How many make 4 sets?

9. What would 6 sets of knitting-needles cost at the rate at which Lottie bought hers?

10. If a set of knitting-needles costs 4 cents, what will 8 needles cost?

LESSON XVIII.

1. Write in figures and signs the following: Nothing from fifteen leaves fifteen. Nothing multiplied by two equals nothing. Eight plus nothing, plus two, plus four, plus six, equals twenty. Twelve minus nothing equals twelve. Ten minus ten equals nothing. Sixteen divided by sixteen equals one. Sixteen divided by nothing equals sixteen.

2. What is the name of the character used to express nothing? *Answer.* Naught, or cipher, is the name of the character used to express nothing.

3. Write in words:

$9 + 9 = 18.$
$17 - 7 = 10.$
$8 - 8 = 0.$
$0 \times 6 = 0.$
$6 \div 0 = 6.$
$11 + 0 = 11.$
$7 \times 1 = 7.$
$1 \times 1 = 1.$
$15 \div 3 = 5.$

4. Add:

2 to 10.
3 to 10.
10 to 10.
6 to 10.
8 to 10.
9 to 10.

5. Add 15 to 10. *Answer.* $10 + 15 = 25.$

6. How many times does the sun set in one week?

7. How many times does the sun rise in 3 weeks?

8. Write the days of the week.

9. How many are $6 + 6 + 4 - 9 - 1$?

10. How many are $2 \times 3 + 5$?

11. $6 + 9 + 5 - 10 =$ how many?

LESSON XIX.

1. 20 – 10 equals how many?

2. 8 from 20 leaves how many?

6 from 20?	4 from 20?	9 from 20?
12 from 20?	11 from 20?	15 from 20?

3. 12 subtracted from 12 leaves how many? 9 from 19?

4. In a class of 18 pupils there is an equal number of boys and girls; how many girls in the class? How many boys in the class? What is one-half of 18?

5. Little Herbert's uncle Dick was very fond of him, and promised to make him a two-wheeled cart in which to haul sand when they went to the Beach. When the spokes were ready for the wheels there were 20 for both wheels. Herbert counted them, and gave half the number to uncle Dick, with one hub and one felly to put together to make one wheel. How many spokes was each wheel of the cart to have?

6. Draw a wheel and name the parts. Write "hub" on the hub. Write "spoke" on one of the spokes. Write "felly" on the rim, and on the outer edge of the rim write "tire."

7. When uncle Dick had finished the cart, he took it to the blacksmith's shop and had the tires set. Of what are the hubs made? the spokes? the fellies? the tires? How many tires did this cart have?

8. Harry, Frank, and Tommy each have an ear-trumpet. How much did they cost, at 3 dollars apiece?

LESSON XX.

1. Make all the different figures and signs which you have used.

2. Add 3 and 7 and 2 and 4 and 0. Would you read this "three and seven and two and four and cipher are sixteen"? What would you call the cipher?

3. What is the name of the sign +? of the sign −? of the character 0? of the sign =?

4. Has the sign × a name?

5. Has the sign = a name?

6. Has the sign ÷ a name?

7. How is the sign ÷ read? the sign ×? the sign =? the sign +? the sign −? the character 0?

8. How many are 12 − 2?

17 − 7?	14 − 4?	16 − 8?
16 − 6?	13 − 3?	19 − 9?

9. Subtract 10 from 17.

10 from 19.	10 from 13.	10 from 14.
10 from 16.	10 from 12.	10 from 15.

10. Add 9 to 10.

6 to 10.	5 to 10.	4 to 10.
8 to 10.	7 to 10.	3 to 10.

11. Lena pays 5 cents each time she rides in the horse-car; how many times can she ride for 20 cents?

12. The fare in some horse-cars is 6 cents; how much would it cost to ride twice at that rate? How much to ride 3 times? 4 times?

13. What is the name of a ten-cent piece?

14. What is the name of a twenty-five-cent piece?

15. Add 10 to each of the following: 3, 7, 4, 9, 6, 10, 1, 8, 2, 5; thus, $3 + 10 = 13$; $7 + 10 = 17$; etc.

16. Subtract 10 from each of the following: 16, 17, 20, 12, 11, 19, 14, 15, 18, 10, 13; thus, $16 - 10 = 6$.

17. Divide each of the following by 2: 18, 16, 14, 20, 10, 8, 6, 2, 12, 4; thus, $18 \div 2 = 9$.

18. Multiply each of the following by 2: 8, 6, 7, 9, 5, 10, 1, 3, 4, 11, 12.

LESSON XXI.

1. Add each of the following numbers to 10: 8, 6, 4, 9, 3, 2, 1, 5, 7; thus, $10 + 8 = 18$.

2. What number must be added to each of the following to get 20? 17. 10. 19. 16. 8. 3. 12. 14. 2. 5. 15. 4. 18. 13. 11. 9. 7. 6. 1. *Answer.* 3 must be added to 17 to get 20, etc.

3. If you have forgotten what "etc." means, your teacher will tell you again. It is used here to show that all the other answers are to be written like the one given.

4. Do not forget that you are always to write the *questions* as well as the answers.

5. Write the answer to the following in full:

6. 12 from 12 leaves how many?

4 from 9?
6 from 12?
6 from 20?
6 from 13?
9 from 15?
9 from 20?

2 from 8?
7 from 10?
7 from 12?
12 from 15?
3 from 9?
2 from 2?

8 from 15?
6 from 17?
5 from 10?
5 from 15?
5 from 20?
5 from 12?

7. Mr. Arthur in planting trees in the grounds about his new residence set 6 elm trees, which grow rapidly, the same number of maples, 5 oaks, 3 horse-chestnuts, and 4 pines. How many trees did he set out? Draw a maple leaf, an oak leaf, a horse-chestnut leaf. What are the nuts which grow on oak trees? Write the names of as many other trees as you can think of. If only half the trees live which Mr. Arthur has set out, how many must he get the next spring to have the same number as were at first planted?

LESSON XXII.

1. Subtract 17 from 20, using the signs of subtraction and equality; 15 from 20; 18 from 20.

2. Add 8 and 8, using the signs of addition and equality; 6 and 6; 4 and 4; 3 and 3; 9 and 9; 7 and 7; 2 and 2; 5 and 5; 10 and 10.

3. Divide 20 by 2; by 4; by 5; by 10; using the signs of division and equality.

4. Divide 16 by 2; by 16; by 4; by 8; by 1.

5. Divide 15 by 5; by 1; by 3; by 15.

6. Multiply 4 by 5, 2 by 10, 20 by 1, 5 by 4, 10 by 2; thus, $4 \times 5 = 20$; $2 \times 10 = 20$. Once 20 is 20, or $20 \times 1 = 20$.

7. Bert had 6 squirrels in a cage, but one day he carelessly left the door of the cage open, and they all ran away to the woods; how many were left in the cage? Write the answer in full.

8. Fannie's old mahogany bureau has 5 large drawers and 4 small drawers. All the drawers except the upper large one, which is opened from underneath, have knobs; the large drawers have 2 apiece, and the small ones have 1 each; how many knobs on the bureau?

9. Willie gives his gray African parrot 6 peanuts in the morning before he goes to school, twice as many at noon, and 6 at night. How many peanuts does Polly get during the day?

LESSON XXIII.

1. What is the difference between 7 and 11? *Answer.* 11 is 4 more than 7, or 7 is 4 less than 11.

2. What is the difference between 8 and 12?

3. What is the difference between 12 and 20?

4. What is the difference between 20 and 25?

5. How many sheets of paper make a quire?

6. How many sheets of paper does your mother use in writing 8 letters, if each letter takes 1 sheet?

7. How many sheets would she use if each letter should require 2 sheets? How many sheets would be left from a quire of paper? How many envelopes would she use? How many postage stamps if all the letters were going through the mail? How much will the stamps cost if they are all 2-cent stamps?

8. If your mother should give you a quarter of a dollar and tell you to keep what was left after buying the stamps for her 8 letters, how much money

would you have to spend for yourself? Would you have money enough to buy a buzz top?

9. How much is the letter postage to Europe? Find Europe on the map.

10. How many 5-cent stamps could you buy for a quarter of a dollar?

11. What is the postage from New York to San Francisco?

12. From the United States to England?

13. Find the United States.

14. Find England.

15. In which of the United States do you live?

16. Is Canada in the United States?

17. Find Canada on the map.

18. How much is the postage to Canada?

19. Draw a map of the State in which you live.

LESSON XXIV.

1. Write the multiplication table of 2's as far as "12 times 2."

2. Write the multiplication table of 3's as far as "8 times 3."

3. Write the multiplication table of 4's as far as "6 times 4."

4. Write the multiplication table of 5's as far as "5 times 5."

5. Little Grace throws crumbs to the snow-birds every Sunday morning all winter. Sometimes, when it is very cold and stormy, only a few birds come to

the house, but one bright, sunny morning Grace counted 14 birds; 2 came as near as the window-sill, 4 were on the steps, 2 were very shy and afraid to come down from the trees, 3 were in the walk, and the rest were on the snow. How many were on the snow? Fido, the dog, jumped up to the window and frightened half of the birds away. How many stayed to finish their breakfast? How many did Fido frighten away?

6. Do you ever feed the birds from your window in the winter?

7. Draw a bird.

8. Draw a duck.

9. Draw Fido.

10. What is one-half of 14? of 16? of 18? of 12? of 24? of 8? of 20?

11. How many times will 2 go in 15? in 17? in 16?

12. Divide 18 by 2; thus, $18 \div 2 = 9$. Divide:
16 by 2. 15 by 3. 18 by 9. 25 by 5.
16 by 4. 20 by 5. 22 by 11. 24 by 4.

13. Millard set out 18 plants in his garden; but he forgot to water them, and after two or three days half of them died. How many of Millard's plants lived? Afterward he watered them once a day till it rained. It was a fortnight before it rained. How many times did he water the plants?

14. Hiram's arithmetic paper had 3 mistakes; Paul's had 7, Oliver's 5, and Inez' none; how many mistakes had all the papers? Whose paper had the greatest number of mistakes? How many more had Oliver's than Hiram's?

LESSON XXV.

1. Count by 2's from 2 to 24; thus, 2, 4, 6, etc.
2. Count by 2's from 1 to 25; thus, 1, 3, 5, etc.
3. Count by 3's from 3 to 24; thus, 3, 6, 9, etc.
4. Count by 3's from 1 to 25; thus, 1, 4, 7, etc.
5. Count by 3's from 2 to 23; thus, 2, 5, 8, 11, etc.
6. Count by 4's from 4 to 24.
7. Count by 4's from 1 to 25.
8. Count by 4's from 2 to 24.
9. Count by 5's from 5 to 25.
10. Count by 6's from 6 to 24.
11. Count by 7's from 7 to 21.
12. Count by 8's from 8 to 24.
13. Little Tim, the newsboy, pays 3 cents apiece at the office for his newspapers; he sells them on the street for 5 cents apiece. How much does he make on each paper? How many papers can he buy for 15 cents? For how much will he sell 5 papers? How much will he make on 5 papers? How many papers must he sell to make 20 cents?
14. If little Tim sells only 5 papers a day, how many days will it take him to earn 20 cents?
15. How many of Tim's papers can your father buy for a quarter? If he buys one daily, how long will it take to buy a quarter's worth?
16. How many of Tim's newspapers could you buy for 4 five-cent pieces? For 3 five-cent pieces? for 1 five-cent piece? for 5 five-cent pieces?
17. Which is larger, a five-cent piece or a ten-cent piece?
18. Which is worth the most?

LESSON XXVI.

1. Add 12 to itself; thus, $12 + 12 = 24$.

2. Add:

10 to itself.
9 to itself.
3 to itself.
8 to itself.
2 to itself.
11 to itself.
6 to itself.
1 to itself.
7 to itself.

3. Since 12 units make one dozen, how many units are there in two dozen? Illustrate.

4. A unit is a single thing.

5. How many units in 12?

6. How many dozen in 12?

7. How many dozen in 24?

8. Bert found 20 eggs on the hay and 1 in a barrel; how many more must he find to make 2 dozen?

9. Mrs. Mason cooked a dozen eggs for breakfast, put 4 eggs in a custard, and 4 in a cake; how many eggs did she use?

10. What will a dozen and a half eggs cost at a cent apiece?

11. Harold bought a bunch of half a dozen lead-pencils at 4 cents apiece; how much did he pay for them? How much change did he get from a quarter?

12. Two dozen is how many more than a dozen and a half?

13. Willard hurt his hand severely on the 4th of July with his toy-pistol. He paid 25 cents for the pistol; how many dozen fire-crackers at 5 cents a dozen could he have bought with the money?

14. If one dozen fire-crackers cost 5 cents, what will 4 dozen cost? what will 3 dozen cost? what will 5 dozen cost?

* * *

LESSON XXVII.

1. 2 dozen cocoanuts are how many more than 1 dozen?

2. 12 is what part of 24?

3. 19 is how many more than 3 times 3?

4. 25 is 5 more than how many?

5. 20 is 15 more than what number?

6. What number is twice as many as 2 and 2?

7. How many times will 8 go in 24?

8. By what number is 8 multiplied to get 24?

9. 6 times 4 are how many more than 20?

10. What is the sum of 12 and 12?

11. What is the amount of 10 added to 13?

12. How many pounds of dates at 10 cents a pound can be bought for 20 cents?

13. Morrill paid 25 cents for 2 pounds of dates at the above price; how much did he get in change?

14. What will 3 pints of roasted chestnuts cost at 8 cents a pint?

15. How much more will a box of grapes cost at 25 cents a box than a dozen peaches at 2 cents apiece?

16. Henry bought a bunch of envelopes, and used 2 a day for a week. How many had he left at the end of that time?

17. Rose made 9 tassels for each end of a tidy; how many tassels did she make?

LESSON XXVIII.

1. Find the sum of 1, 2, 3, 4, and 10.
2. Find the difference between 6 and 16.
3. Take 3 plus 3 from 4 plus 4.
4. Take 1 and 2 and 3 and 4 from twice 5.
5. What number is 9 more than 15?
6. What is one-half of 4 times 4?
7. 12 is 10 less than what number?
8. 10 is what part of 20?
9. What number is 1 less than 18?
10. Find the amount of 11 added to 11.
11. How many more is 15 than 20?
12. How many less is 15 than 25?
13. Make 10 marks, and cross off half of them at sight.
14. How many are — and — and —?
15. Miss Shaw gave Carroll 15 arithmetic questions, and Georgie 8 more than Carroll; how many questions did she give Georgie? How many less did she give Carroll than Georgie?
16. There are 4 bones in the palm of the hand, 3 in each finger, and 2 in the thumb; how many bones are in your right hand? Draw a hand holding a pencil.
17. There are 8 bones in the wrist; how many more bones are there in the fingers than in the wrist?
18. Katie's age is 7 years less than her brother Harry's; Harry is 19. How old is Katie? How much older is Harry than Katie?

19. If Gray & Duncan employ 15 cash-boys through the year, how many more must they engage to have 25 during the holidays?

LESSON XXIX.

1. Multiply 5 by itself; use figures and signs. Illustrate with marks.

2. Multiply 4 by itself; 3 by itself; 2 by itself; 1 by itself.

3. Once 1 is 1, or 1 × 1 = 1.

4. Subtract:

15 from 20.
8 from 14.
6 from 11.
9 from 16.
7 from 14.
7 from 12.
7 from 13.
6 from 12.
7 from 12.

5. Into what pairs of numbers can 10 be separated?

6. How many are — ÷ —?

7. How many are 9 and 8? four times four? 6 times 3?

8. Twice two are how many? Twice nine? Twice six?

9. Once 1 is how many?

10. Double 9, 7, 6, 12, 1, 10, 8, 2, 11, 5, 3, 4, using the form "Twice 9 are 18. Twice 7 are 14," etc.

11. What is one-half of 24? of 16? of 12? of 8? of 14? of 20? of 22? of 18? of 10?

12. Double 10, 8, 7, 9, and 12, using the form "10 and 10 are 20," etc.

13. Double 6, 4, 11, 5, 9, 12, 1, 10, 2, 8, 3, and 7, using the form "6 + 6 = 12."

14. How many are $8 + 7 + 5 - 10$?

15. How many are twelve minus three plus nine plus one?

16. When the numbers in the question are written in words, write the answer in words; and when figures are used in the question, use figures in the answer.

17. How many are $6 + 6 + 6 - 12$? 20 less 8 plus 6? 17 and 3 less 1? 9 from 15? $12 + 8 \div 4$? $3 + 6 + 5 + 2 \div 8$?

18. Mr. and Mrs. Gould, and Millie and Millie's Auntie, have to cross the ferry in coming to the city and in going home. The fare is 2 cents apiece each way; how much is it both ways? How much will Millie have left from 2 dimes after paying all the fares over and back?

19. To how many children can Miss Estabrook give 24 cherries, if she gives them 6 cherries apiece?

20. How many wish-bones have 12 chickens?

LESSON XXX.

1. Copy and fill out the following:

$10 + \quad = 20.$
$17 + \quad = 20.$
$15 + \quad = 20.$
$12 + \quad = 20.$
$16 + \quad = 20.$
$9 + \quad = 20.$
$8 + \quad = 20.$
$3 + \quad = 20.$
$7 + \quad = 20.$

$20 - 6 =$
$20 - 16 =$
$20 - 4 =$
$20 - 18 =$
$20 - 9 =$
$20 - 12 =$
$20 - 11 =$
$20 - 7 =$
$20 - 19 =$

$20 - \quad = 10.$
$20 - \quad = 17.$
$20 - \quad = 13.$
$20 - \quad = 12.$
$20 - \quad = 9.$
$20 - \quad = 8.$
$20 - \quad = 15.$
$20 - \quad = 18.$
$20 - \quad = 6.$

$19 + \quad = 20.$
$1 + \quad = 20.$
$11 + \quad = 20.$
$18 + \quad = 20.$

$20 - 1 =$
$20 - 18 =$
$20 - 2 =$
$20 - 10 =$

$20 - \quad = 11.$
$20 - \quad = 14.$
$20 - \quad = 2.$
$20 - \quad = 5.$

2. What number added to itself makes 20?

3. Tilly's mother gave her 25 cents with which to buy rolls and buns for supper. The rolls were 10 cents a dozen and the buns a cent apiece. Tilly got 1 dozen rolls and as many buns as she could buy with the rest of the money; how many buns did she get?

4. After supper she went to the baker's again, and got 2 five-cent loaves of bread, and a yeast-cake worth 2 cents. How much more did she spend the first time she went to the baker's than the second time? How much more did the buns cost than the bread? Which cost the most, the rolls or the bread?

5. Mr. Williams pays 3 dollars a day for board at the hotel; how much does he pay a week?

LESSON XXXI.

1. Divide 20 by 2; thus, $20 \div 2 = 10$.
2. Divide 20 by 5; by 4; by 10.
3. Divide 24 by 4; by 6; by 12; by 2; by 3; by 8.
4. Divide 16 by 2; by 8; by 4.
5. Divide 12 by 3; by 4; by 2; by 6.
6. When 9 is divided by 3, is anything left over?
7. When 10 is divided by 3, is anything left over?

8. When 11 is divided by 3, is there a remainder, or anything left over?

9. Divide 20 by all the numbers which will go in in it without a remainder; thus:

$20 \div 2 = 10.$ $20 \div 5 = 4.$

$20 \div 4 = 5.$ $20 \div 10 = 2.$

10. Will 7 go in 20 without a remainder? *Answer.* No; it will not. What is the remainder? *Answer.* 6 is the remainder. Illustrate; thus, IIIIIII, IIIIIII, IIIIII.

11. Will 6 go in 20 without a remainder? What is the remainder? Illustrate; thus, IIIIII, IIIIII, IIIIII, II.

12. Will 3 go in 20 without a remainder? What is the remainder? Illustrate.

13. Will 4 go in 20 without a remainder? *Answer.* Yes; it will.

14. Will 10 go in 20 without a remainder? Illustrate.

15. Will 12 go in 20 without a remainder? Illustrate.

16. Will 5 go in 20 without a remainder?

17. Mrs. Prince bought 20 sticks of candy for her 5 children, which she divided equally among them; how many sticks did she give each child? Eunice, the eldest of the children, saved half of hers to give to baby Maud after Maud's was gone. How many sticks of candy did Eunice keep for herself? How many did she give Maud? How much did Mrs. Prince pay for the candy at a cent a stick?

LESSON XXXII.

1. Divide 16 by all the numbers which will divide it without a remainder, as 20 is divided in the last lesson.

2. Divide 24 by all the numbers which will divide it without a remainder; thus:

$24 \div 2 =$
$24 \div 3 =$
$24 \div 6 =$
$24 \div 4 =$
$24 \div 12 =$
$24 \div 8 =$
$24 \div 24 =$
$24 \div 1 =$

3. Divide 16 by all the numbers which will divide it without a remainder.

4. Divide 12 by all the numbers which will divide it without a remainder.

5. Is there any number which will divide 11 without a remainder?

6. Is there any number which will divide 7 without a remainder?

7. Can 5 be divided without a remainder? Can 12? Can 13? Can 14? Can 15? Can 16? Can 17?

8. A poor old beggar came along to a country school-house one day just as school was out at noon. He looked tired and heated, and the children felt sorry for him. Will gave him an apple, and asked him to sit down on the play-ground; Molly sent him a slice of bread and butter by her brother Jim; and Helen gave him a cookie and a doughnut; each of the six large boys gave him two cents apiece; and Miss May, the teacher, gave him enough more to make twenty-five cents. How many cents did Miss May give the beggar?

LESSON XXXIII.

1. Ask your teacher if there is a "two-foot rule" in the school-room which you can use. When the rule is open, how long is it? *Answer.* When the rule is open, it is 2 feet long. When the rule is doubled once, how long is it? *Answer.* When the rule is doubled once, it is 1 foot long.

2. How many inches in a foot?

3. Fold the rule once more, and count the inches, and tell how long it is.

4. How many inches in half a foot?

5. What is one-half of 12?

6. How many inches in 2 feet?

7. How many inches in 1 foot and a half?

8. Nelson is just three feet tall, and his father is twice as tall; how tall is Nelson's father? Nelson's colt is 1 foot taller than Nelson; how tall is the colt? We usually speak of horses as so many "hands high" instead of so many "feet tall." There are four inches in 1 hand; how many hands in 1 foot? How many hands in 3 feet? How many hands in 4 feet? How many hands high is Nelson's colt?

9. How much taller is Nelson's father than the colt?

10. Nelson has a brother who is the same height as the colt; how tall is his brother?

11. Measure your slate-frame, and tell how long it is in inches.

12. If there is a little more or less than a given number of inches, say that it is "a little more than," or "nearly," or "about," or "not quite" —— inches.

13. Draw a straight line 3 inches long.

14. Try to draw one just 4 inches long without a measure, and divide it into inches. Measure, and see if your line is just 4 inches long.

15. Draw one a little more than 3 inches long.

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LESSON XXXIV.

1. Martha's slate is a foot long and 9 inches wide; how much greater is its length than its width?

2. Draw a square. The sides of a square are all of the same length.

3. How many sides has a square?

4. How many inches around a square which is 3 inches on a side?

5. Are the sides of a square all the same length?

6. Draw a square each side of which is 2 inches in length.

7. Is your slate square?

8. Are any of your books square?

9. Is a sheet of writing-paper square?

10. Is the numeral-frame square?

11. Is the window square? the door? the top of your desk?

12. Are the window-panes square?

13. Alma sews 9 squares of her patch-work together to make one block; when the block is finished, there are 3 squares on a side; is the block square? Draw a diagram representing a block of Alma's patch-work.

14. How many are 3 times 3?

15. Alma is piecing a bed-quilt for her doll's bed. It is to be 5 blocks long and 4 blocks wide; how many blocks must she have?

16. How many are 5 times 4?

17. Draw a diagram of 20 blocks with 5 one way and 4 the other.

18. Alma has 13 blocks pieced; how many more must she piece to finish the quilt? Will the bed-quilt be square?

LESSON XXXV.

1. How many blocks in a bed-quilt 4 blocks long and 3 blocks wide?

2. How many panes of glass in a window which has 3 panes in width and 4 panes in height?

3. How many panes in 2 such windows?

4. If the upper and lower sashes are the same size, how many panes are there in each sash?

5. Of what are the window-panes made?

6. Of what is the sash made?

7. How many panes of glass in the windows in this room?

8. How many windows in the room?

9. Are the panes in these windows square?

10. Did you ever see a square window?

11. Are the windows in a dove-house square?

12. How many windows in a dove-house which has 4 windows on each end and none on the sides?

If half of them are false windows, through how many of them can the doves go in and out?

13. There are 12 wild doves and 4 tame ones that stay about Mr. Lovell's house and stable; how many doves are there? If half of them were tame, how many tame ones would there be? How many wild ones would there be?

14. Double the numbers from 1 to 12.

15. Add:

9 and 6.
7 and 4.
12 and 8.
16 and 9.
14 and 6.
18 and 7.

16. Subtract:

9 from 18.
9 from 20.
8 from 20.
6 from 20.
7 from 21.
10 from 21.

17. What number added to itself makes 14?

LESSON XXXVI.

1. Write 7, 9, 6, 5, 8, 12, 5, 10, and 4 in a column, and multiply each number by 2, using the signs of multiplication and equality.

2. Write the same column again, and add each number to itself, using the signs of addition and equality.

3. Write the same column again, and double each number, using the form "Twice 7 are 14," etc.

4. Mabel's old doll-house had only 4 rooms. Her new one has 7 rooms beside the attic where she keeps the dolls' trunks. Counting the attic as a room, how many more rooms in the new doll-house than in the old one? The new doll-house is 4 feet high to the eaves, and has 2 floors below the attic. On the first floor are the kitchen, dining-room, and parlor. On the upper floor there are a nursery, sewing-room, and 2 bed-chambers. In the kitchen there are a stove, a table, and 2 chairs. In the dining-room there are a dining-table, a small side-table, 6 chairs, and a sideboard cupboard for the dishes. The parlor, which Mabel always calls the drawing-room, is very prettily furnished. It has a piano, a sofa, 2 easy-chairs, a rocking-chair, 4 other chairs, 2 tables, a book-case, an ottoman, a hassock, and a piano-stool. How many pieces of furniture in the parlor? How many in the dining-room? How many more pieces of furniture in the parlor than in the kitchen?

5. Mabel has a great many paper-dolls, which she usually keeps in the nursery. She gave her cousin Charity 8 paper-dolls, and she then had 16 left. How many did she have before she gave any away? Mabel also has a wax doll, a doll-baby, a rubber doll which she had when a little child and of which she is very fond, a worsted doll, and 4 other dolls. How many dolls has she of all kinds?

6. How many more rooms are there on the second floor of Mabel's house than on the first? How many more dolls has Mabel than you have?

7. Which is most, one-half or one-fourth of a loaf of cake?

8. How many quarters in one dollar?

9. How many quarters in one-half dollar?

LESSON XXXVII.

1. What is the sum of 1, 2, 3, 4, 5, and 6?

2. How many times will 2 go in 16? in 17? in 18? in 19? in 20? in 24? in 12? in 4?

3. Divide 24 by all the numbers which will divide it without a remainder.

4. Multiply 2 by 2; 3 by 3; 4 by 4; 5 by 5.

5. Add four 5's; thus, $5 + 5 + 5 + 5 = 20$.

6. Add three 8's; three 7's; three 6's; four 6's; two 9's.

7. Subtract:

9 from 16.
9 from 15.
9 from 18.
9 from 17.
9 from 12.
9 from 21.

8. Make the sign plus, the sign minus, the sign of multiplication, the sign of division, the sign of addition, the sign of subtraction, the sign of equality.

9. Copy and fill out the following:

$2 \times \quad = 20.$
$4 \times \quad = 20.$
$5 \times \quad = 20.$
$10 \times \quad = 20.$
$2 \times \quad = 12.$
$3 \times \quad = 12.$
$4 \times \quad = 12.$
$6 \times \quad = 12.$
$2 \times \quad = 16.$
$4 \times \quad = 16.$
$8 \times \quad = 16.$
$1 \times \quad = 16.$

10. If 12 kites are given to 12 boys, how many kites will each boy receive?

11. How many yards of string do you think a good strong kite should have?

12. How many feet make a yard?

13. Get a string and the rule, and measure off 1 yard, and tie a knot in the string for a marker, and ask your teacher if you have measured it correctly.

14. Go to the school-room slate or blackboard, and draw a straight line as nearly a yard long as you can.

15. Did you get it *just* a yard? If not, how many inches more or less than a yard was your line?

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LESSON XXXVIII.

1. Have you anything in the room which is a perfect cube?

2. Your alphabet blocks are cubes if all the sides are of the same size, and perhaps you use cubes much smaller than these blocks for counters.

3. Take a cube in your hand, and count the sides, and tell how many there are.

4. The game of backgammon which you see older people play and which, perhaps, you play yourself, is played with checkers and small ivory cubes called dice. There are black dots on each side of the cube, different numbers on all the different sides. On one side there is 1 spot; on another side there are 2 spots; on another, 3 spots; on another, 4 spots; on another, 5 spots; and on another, 6 spots. How many spots on the 6 sides of a die?

5. Only two persons play backgammon together, and each player has two dice; how many dice are used in playing a game of backgammon? How many sides have the four dice?

6. How many are 6 × 4?

7. How many are 4 × 4? 3 × 4? 5 × 4? twice 4?
8. Write or repeat the multiplication table of 2's.
9. How many are 3 times 8?
10. 10 subtracted from 25 leaves how many?
11. 12 added to 13 equals how many?
12. 18 divided by 9 equals how many?

LESSON XXXIX.

1. If Fred, Morrill, Harry, and Frank can shovel the snow from the sidewalk in a quarter of an hour, how long will it take Harry to clear off the sidewalk alone?

2. Fernald & Sawyer have 19 horses in their stable. If 4 horses are out with single sleighs, how many spans can they send out? After sending out 7 spans, is there an odd horse left?

3. Make 20 marks in 4 groups, making a fourth of the marks in each group.

4. What will a quarter of a pie cost, if the whole pie costs 20 cents.

5. What will one-half of a cheese cost, if the whole cheese costs 6 dollars?

6. If one-fourth of a roast of beef weighs 1 pound, what is the weight of the entire roast?

7. 5 is one-fourth of what number?
8. 12 is one-half of what number?
9. Give one-half of some number.
10. Give one-fourth of some number.

SECTION III. — NUMBERS FROM ONE TO FIFTY.

LESSON I.

1. Write the figures from 20 to 30.

2. Count by 2's from 20 to 30; from 1 to 21.

3. Write the figures backward from 30 to 20.

4. What number added to itself gives 24?

5. Write 17, 14, 13, 20, 16, 9, 19, 12, and 8 in a column, and add 10 to each number, using the signs.

6. Write the same column again, and add 9 to each number.

7. Write the same column again, and subtract 9 from each number.

8. Write "fifteen subtracted from thirty leaves fifteen," using figures and signs instead of words.

9. How many 5-cent pieces must Calvin spend for 2 quires of paper at 15 cents a quire?

10. George and Fred threw a ball back and forth to each other 30 times. George caught it every time, but Fred failed to catch it 5 times; how many times did Fred catch the ball? How many times did George catch the ball? How many more times did George catch it than Fred? How many less times did Fred catch it than George? How many more times would Fred have caught it if he had caught every time?

11. Afterward the boys began throwing the ball against the stable. Each was to play until he failed to catch the ball, when the other was to take his turn. George caught the ball 6 times and then missed it; then Fred caught it 10 times before he dropped it; then George caught it 9 times, and Fred 3 times; then George once, and Fred 15 times more. How many times did George catch the ball? How many times did Fred catch the ball? How many more times did Fred catch it than George?

LESSON II.

1. Express "Six subtracted from thirteen leaves seven" in all the forms you know; thus:

6 subtracted from 13 leaves 7. $13 - 6 = 7$.
6 from 13 leaves 7. 13 less $6 = 7$.
6 taken from 13 leaves 7. 13 minus 6 equals 7.

2. Express "Nine added to seven equals sixteen" in as many forms as possible; thus:

9 added to 7 equals 16. 9 and 7 are 16.
$9 + 7 = 16$. 9 plus 7 equals 16.

3. Express "Fifteen added to fifteen equals thirty" in as many forms as you can.

4. Express "Twelve added to eight equals twenty" in as many forms as you can.

5. Express "Nine subtracted from twenty-five leaves sixteen" in six forms.

6. Express "Twenty subtracted from thirty leaves ten" in 6 forms.

7. Express "Thirty divided by five equals six" in the following forms:

30 divided by 5 equals 6. 5 in 30, 6 times.
$30 \div 5 = 6$.

8. Express "Twenty-eight divided by four equals seven" in three forms.

9. Express "Twenty-one divided by seven equals three" in three forms.

LESSON III.

1. Express "Six multiplied by five equals thirty" in the following forms:

6 multiplied by 5 equals 30. 5 times 6 are 30.
$6 \times 5 = 30$.

2. Express "Ten multiplied by three equals thirty" in three forms.

3. Count from 30 to 40, writing the numbers in figures.

4. Count backward from 40 to 30, writing the numbers in words; thus, forty, thirty-nine, thirty-eight, etc.

5. Ira reads a certain number of chapters in his library book every day. He has read 20 chapters in 4 days; how many chapters does he read daily? There are 30 chapters in his book; how many more has he to read? How many days will it take him to finish the book?

6. Count from 40 to 50.

7. Count backward from 50 to 40.

8. Count by 2's from 20 to 50.

9. Write or repeat the multiplication table of 2's in four forms, as follows:

Twice 1 are 2.	$2 \times 1 = 2$.
Twice 2 are 4.	$2 \times 2 = 4$.
Twice 3 are 6.	$2 \times 3 = 6$.
etc.	etc.
Once 2 is 2.	$1 \times 2 = 2$.
Twice 2 are 4.	$2 \times 2 = 4$.
3 times 2 are 6.	$3 \times 2 = 6$.
etc.	etc.

10. Write or repeat the multiplication table of 3's in four forms; thus:

3 times 1 are 3.	$3 \times 1 = 3$.
3 times 2 are 6.	$3 \times 2 = 6$.
3 times 3 are 9.	$3 \times 3 = 9$.
etc.	etc.
Once 3 is 3.	$1 \times 3 = 3$.
Twice 3 are 6.	$2 \times 3 = 6$.
3 times 3 are 9.	$3 \times 3 = 9$.
etc.	etc.

11. What is the least number of pieces of money in which you can have 19 cents?

12. Name the pieces.

13. How many thumbs have a dozen pairs of mittens?

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LESSON IV.

1. Add 10 to 12; thus, $12 + 10 = 22$.

2. Add:

10 to 13.
10 to 15.
10 to 20.
10 to 30.
10 to 40.
10 to 50.

3. Count by 2's from 30 to 40.

4. Count from 20 to 30, writing the numbers in words.

5. Subtract:

10 from 19.	10 from 26.	10 from 13.
10 from 18.	10 from 29.	10 from 23.

6. Count from 30 to 40, writing the numbers in figures.

7. Count from 40 to 50, writing the numbers in words.

8. Give the pairs of numbers which make 11.

9. Write the numbers from 10 to 20, inclusive, in a column, and then add 10 to each. Add 7 to each. Add 9 to each.

10. Count backward from 30 to 20, using figures.

11. Nelson earns ten cents by clearing the snow from the walks every time it snows. How many times must he clear the walks to get money enough to buy a 40-cent hatchet?

12. One week he shovelled snow every morning before going to school; how much money had he earned Friday night? He put 25 cents in his bank, and spent 20 cents for a foot-rule; how much money did he have left of the 50 cents earned that week?

13. Nelson wants to buy a set of dominos which costs 50 cents; how many times must he shovel snow to earn enough to pay for them?

14. How many cents in a quarter of a dollar?

15. How many cents in half a dollar? in a dime?

16. Of what is a 50-cent piece made?

17. Of what is a quarter made? Of what is a dime made? a 5-cent piece?

18. How many quarters in 50 cents? How many dimes? How many 5-cent pieces?

LESSON V.

1. Count by 5's from 5 to 50; thus, 5, 10, 15, 20, etc.

2. How many 5-cent pieces in 50 cents?

3. How many 5-cent pieces in 25 cents?

4. How many 5-cent pieces in a dime? in 2 dimes? in 3 dimes?

5. How many quarters in 50 cents?

6. How many dimes in 50 cents?

7. Draw a circle as nearly the size of a 50-cent piece as you can. Draw another as nearly the size of a quarter as you can.

8. Which is larger, a half dollar or a quarter? Which is thicker? Which is heavier?

9. Draw a circle as near the size of a 10-cent piece as you can.

10. Draw a circle as near the size of a cent as you can.

11. How many dimes in half a dollar?

12. Which is larger, a 2-cent piece or a nickel?

13. Which is larger, a cent or a 10-cent piece? Which is worth the most?

14. How much greater is the value of a 10-cent piece than 1 cent? *Answer.* A 10-cent piece is 10 times as great as 1 cent.

15. How much more is a 50-cent piece worth than a 25-cent piece? *Answer.* A 50-cent piece is worth twice as much as a 25-cent piece.

16. How much more is a 10-cent piece worth than a 5-cent piece?

17. How much more is a 25-cent piece worth than a 5-cent piece?

18. Frankie took a 50-cent piece to the grocery store to get change for his mother. She wanted to pay the scissors-grinder 15 cents for sharpening her shears. Frankie came back with 2 quarters; could his mother pay the scissors-grinder? Frankie went again with one quarter; what change do you think he brought back this time?

LESSON VI.

1. $30 - 10 =$ how many?

$50 - 10 = ?$ $25 - 10 = ?$ $29 - 10 = ?$
$40 - 10 = ?$ $27 - 10 = ?$ $39 - 10 = ?$
$20 - 10 = ?$ $35 - 10 = ?$ $49 - 10 = ?$

2. $20 \div 5 =$ how many?

$30 \div 5 = ?$ $50 \div 5 = ?$ $10 \div 5 = ?$
$25 \div 5 = ?$ $15 \div 5 = ?$ $5 \div 5 = ?$
$35 \div 5 = ?$ $45 \div 5 = ?$ $40 \div 5 = ?$

3. $5 \times 5 =$ how many?

$5 \times 3 = ?$ $5 \times 5 = ?$ $5 \times 6 = ?$
$5 \times 4 = ?$ $5 \times 2 = ?$ $5 \times 8 = ?$

4. 25 + 10 = how many?

33 + 10 = ?
17 + 10 = ?
12 + 10 = ?
28 + 10 = ?

10 + 10 = ?
40 + 10 = ?
21 + 10 = ?
16 + 10 = ?

37 + 10 = ?
40 + 10 = ?
11 + 10 = ?
26 + 10 = ?

5. It costs 5 cents to send a letter to Europe; what will it cost to send 2 letters? If you buy 50 cents' worth of 5-cent stamps, how many stamps will you get? If you send 9 letters, how many stamps will you have left?

6. Find Europe on your map.

7. How much will it cost to send 2 letters to England when both letters are over-weight and require double postage? You remember that when a letter is over-weight it is too heavy to go for one stamp.

8. Write or repeat the multiplication table of 5's as far as 5 times 10, in four forms; thus:

Once 5 is 5.
Twice 5 are 10.
3 times 5 are 15.
etc.

1 × 5 = 5.
2 × 5 = 10.
3 × 5 = 15.
etc.

5 times 1 are 5.
5 times 2 are 10.
5 times 3 are 15.
etc.

5 × 1 = 5.
5 × 2 = 10.
5 × 3 = 15.
etc.

9. Guy writes home twice a week; how much will his postage cost for a term of ten weeks, if none of his letters are over-weight?

10. Mr. Martin buys a Sunday paper, a 5-cent paper every morning except Sunday morning, and a 3-cent paper every night except Sunday night. How many papers does he buy in 1 week?

11. How many times will 5 go in 25? in 35? in 45? in 50? in 40? in 20? in 10?

12. How many times will 10 go in 30? in 20? in 40? in 50? in 10?

LESSON VII.

1. Count backward by 5's from 50 to 5; thus, 50, 45, 40, 35, etc.

2. Subtract 5 from 45; thus, $45 - 5 = 40$.

3. Subtract:

5 from 30.	5 from 20.	5 from 35.
5 from 15.	5 from 40.	5 from 10.
5 from 25.	5 from 50.	5 from 5.

4. Write or repeat the multiplication table of 2's backward in two forms.

5. Write or repeat the multiplication table of 5's backward in one form.

6. What is one-half of 50? *Answer*. One-half of 50 is 25.

7. What is:

one-half of 40?	one-half of 26?
one-half of 30?	one-half of 24?
one-half of 28?	one-half of 22?

8. How many are:

5 times 10?	3 times 10?
4 times 10?	twice 10?

9. How many school-days are there in a week?

10. Write the names of the days of the week on which you have school.

11. How many school-days in a fortnight?

12. How many school-days in —— weeks?

13. How many school-days in 8 weeks? in 6 weeks? in 5 weeks?

14. How many holidays in 9 weeks; that is, how many play-days?

15. What day is holiday?

16. How many Sundays in 9 weeks?

17. When Nellie had the whooping-cough she was absent from school 10 weeks. There was one extra holiday during the time; how many days of school did she lose?

18. Mr. Willis drives into town every Monday morning to bring Mace to school, and takes him home every Friday night; how many days does Mace spend in town every week? How many days does he spend at home every week? On which days is he at home?

19. How many days does Mace spend at home in 10 weeks?

20. How many days does Mace spend in town in 10 weeks?

21. Mace lives 10 miles out of town; how many miles does he drive each week?

LESSON VIII.

1. Divide 20 by 2; thus, $20 \div 2 = 10$, and tell what number is one-half of 20; thus, 10 is one-half of 20. Illustrate with marks.

2. Divide 30 by 2, and tell what number is one-half of 30.

3. Divide 40 by 2, and tell what number is one-half of 40.

4. By what is a number divided to find one-half of it?

5. How many are 15 and 15?

6. Make 12 marks, and cross off half of them at sight.

7. How many more are — than —?

8. What is one-half of 30?

9. How many are 16 and 16? Illustrate with counters.

10. What is one-half of 32?

11. How many are 17 and 17?

12. What is one-half of 34? Illustrate.

13. How many are 18 and 18?

14. What is one-half of 36?

15. How many are 19 and 19?

16. What is one-half of 38?

17. How many are 20 and 20?

18. What is one-half of 40? Illustrate.

19. How many are:

twice 12?
twice 13?
twice 14?
twice 15?
twice 16?
twice 17?
twice 18?
twice 19?
twice 20?

20. When going home from school Susan picked up 40 nuts under the beech-trees. She gave half of them to her sister; how many did she keep? How many did she give to her sister?

21. Did you ever see a beech-nut?

22. Do you know a beech-tree?

23. Of what other trees do you know the names?

24. Mr. Cross bought his grandfather a gold-headed cane worth ten dollars, and bought himself an ivory-headed cane worth three dollars; how much did they both cost? How much more did Mr. Cross pay for his grandfather's cane than for his own?

LESSON IX.

1. What number is doubled to get 20?
2. What number is doubled to get 30?
3. What number is doubled to get 40?
4. What number is doubled to get 50?
5. Double 8; thus, $8 + 8 = 16$.
6. Double 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25.
7. 26 children went on a sleigh-ride in a large open sleigh called a barge. There was an equal number of boys and girls; how many boys were there? How many girls were there? Three of the girls were very small, and only drove about town and then were taken home. The others took a long drive out of town. How many children were there after the little ones were taken home? How many girls? How many boys? How many more boys than girls?
8. There are 14 pupils in Miss Holland's French class, and as many more in her German class; how many in both classes? They take 2 lessons a week; how long will it take for a term of 24 lessons?

9. What does "semi-weekly" mean? *Answer.* "Semi-weekly" means "twice a week."

10. Mr. Martin takes the "New York Semi-weekly Tribune" and a daily paper. How many papers does he have a week? How many semi-weekly papers does he get in 18 weeks?

11. How much will 4 "Harper's Weeklies" cost at 10 cents a copy?

12. Gertrude bought 2 papers of needles at 8 cents apiece; how much did they both cost? There were 25 needles in each paper; how many needles did she buy? The needles were of 5 different sizes, an equal number of each. How many needles of each size in a paper?

13. What number multiplied by itself produces 25?

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LESSON X.

1. What number added to itself equals 36?

2. What number added to itself equals 50?

3. What number added to itself equals 38?

4. One morning James found enough eggs for his mother to use in the pudding. The next morning he again found the same number in the same nest. He found in all 8 eggs; how many did he find each morning? If he should find 4 eggs every morning for 9 mornings, how many dozen would that make?

5. Tommy's father promised to give him at night as many cents as he had earned during the day. At night, after receiving the money promised by his father, Tommy had 28 cents; how many cents did he earn? How many cents did his father give him?

6. The next morning Tommy paid 8 cents for a slate-sponge, 2 cents for a pen-holder, 5 cents for a rubber, and 4 cents for a lead-pencil; how many cents did he have left? How many dimes did Tommy have before he spent any of his money?

7. Maria made 16 loaves of bread in 2 weeks, making the same number each week. How many loaves did she make in 1 week? She baked twice a week, the same number each time; how many loaves of bread did Maria make at a baking? How many times did she bake in 2 weeks? How many loaves did she bake in 2 weeks?

8. 16 divided by 4 equals how many?

LESSON XI.

1. How many are twice nothing?
2. 50 is how many more than 25?
3. What number is doubled to get 30?
4. 30 is 10 more than what number?
5. Divide 10 times 5 by the sum of 1 and 1.
6. Divide — times — by —— times ——.
7. How many more than 30 is 40?
8. What is one-half of the sum of 25 and 5?
9. Multiply 1 by 12.
10. How many times will 2 go in 4 times 5?
11. 3 times 8 are twice what number?
12. 4 times 4 are twice what number?

13. 5 times 4 are twice what number?

14. Write one-half with figures; thus, $\frac{1}{2}$.

15. What is $\frac{1}{2}$ of 24?

16. What is added to 24 to get 40?

17. How many must be taken from 50 in order to leave 40?

18. What is this character, 0, called?

19. $12 + 0 =$ how many? $12 + 15 = ?$ $12 + 18 = ?$

20. $12 + 8 + 4 =$ how many? $12 - 8 - 4 =$ how many?

21. Mr. Porter raises poultry for market. One spring he told his little son Carl that he might have for his own as many chickens, turkeys, geese, and ducks as he would take care of. The season was cold, and Carl did not have very good luck, but he succeeded in raising 30 chickens, half as many turkeys, and 5 ducks. His goslings all died, so he had no geese. How many more turkeys than ducks did he have? How many more chickens than turkeys? When the turkeys were killed, how many wings did he have to give to his grandmother?

LESSON XII.

1. 19 taken from 38 leaves how many?

2. Peter took a basket of apples to the fruit-store, and exchanged them for oranges, giving 5 apples for 1 orange. He got 5 oranges; how many apples did he give for them?

3. What is the number called which is sometimes left after dividing?

4. Add 9, 10, 11, and 12, and divide the sum by 2 plus 2 plus 2.

5. 35 children were going to the mountain on an excursion. 25 of the children arrived promptly at the place of meeting, but they had to wait for the others. How many were late?

6. What number must be added to 25 to make 35?

7. How many 10's make 20? 30? 40? 50?

8. What number is 10 more than 20? 10 less than 20?

9. Divide 50 by 2; by 4; by 5; by 10; by 25.

10. What number is only one-half as large as 50?

11. How many 5's must be added together to get 50? Illustrate.

12. What would remain after subtracting two 5's from 25?

13. How many 10's could you subtract from 35 and have 5 left?

14. If Henry is one week gathering 42 bushels of apples, how many boys must he have to help him in order to gather them all in one day?

LESSON XIII.

1. 8 divided by itself equals how many? *Answer.* 8 divided by itself equals 1.

2. 20 divided by itself equals how many?

3. 10 divided by itself equals how many?

4. 45 divided by itself equals how many?

5. 10 added to itself equals how many?

6. 15 subtracted from itself leaves how many?

7. 9 subtracted from 12 leaves how many?

8. Double 25, 20, 13, 16, 14, 21, 15, 17, 19, 18.

9. Write the figures from 35 to 50.

10. $12 \div 2 = ?$
$12 \div 3 = ?$
$12 \div 4 = ?$
$12 \div 6 = ?$
$12 \div 12 = ?$
$20 \div 2 = ?$
$20 \div 4 = ?$
$20 \div 5 = ?$
$20 \div 10 = ?$
$20 \div 20 = ?$
$24 \div 2 = ?$
$24 \div 3 = ?$
$24 \div 4 = ?$
$24 \div 6 = ?$
$24 \div 8 = ?$
$24 \div 12 = ?$
$24 \div 24 = ?$
$30 \div 2 = ?$
$30 \div 3 = ?$
$30 \div 5 = ?$
$30 \div 6 = ?$
$30 \div 10 = ?$
$30 \div 15 = ?$
$30 \div 30 = ?$

11. How many are 6 and 6 and 6 and 6 and 6 and 6?

12. How many are 6 times 6?

13. How many 6's are there in 36?

14. How many are 9 and 9 and 9 and 9?

15. How many are 4 times 9?

16. How many 9's are there in 36?

17. How many are 12 and 12 and 12?

18. How many are 3 times 12?

19. How many 12's are there in 36?

20. How many are 18 and 18?

21. How many are twice 18?

22. How many 18's are there in 36?

23. $36 \div 2 = ?$
$36 \div 3 = ?$
$36 \div 4 = ?$
$36 \div 6 = ?$
$36 \div 9 = ?$
$36 \div 12 = ?$
$36 \div 18 = ?$
$36 \div 36 = ?$

24. If you take a train at midnight and travel 10 hours, what time is it when you leave the train?

LESSON XIV.

1. What number added to itself equals 24? *Answer.* 12 added to itself equals 24.

2. Ruthie's railway fare into town and back is 50 cents; how much is it each way?

3. The ferry fare is 4 cents both ways; how much is it each way?

4. The horse-car fare is 12 cents to City Hall and back; how much is it each way?

5. The railway fare from New York to Boston and return is 10 dollars; how much is it each way?

6. What number added to itself equals 24? 30? 32? 28? 22? 34? 40? 44? 50?

7. Write or recite the multiplication table of 4's in four forms; thus:

Once 4 is 4.	$1 \times 4 = 4$.
4 times 1 are 4.	$4 \times 1 = 4$.

8. Write or recite the division table of 2's in four forms; thus:

2 in 2, once.	$2 \div 2 = 1$.
2 in 4, twice.	$4 \div 2 = 2$.
2 in 6, 3 times.	$6 \div 2 = 3$.
etc.	etc.
1 in 2, twice.	$2 \div 1 = 2$.
2 in 4, twice.	$4 \div 2 = 2$.
3 in 6, twice.	$6 \div 3 = 2$.
etc.	etc.

9. How many rainy months are there in countries where it rains one-half of the year? Where it rains one-quarter of the year?

10. Mr. Hale's orchard has 6 rows of apple-trees, and 6 apple-trees in a row; how many apple-trees in the orchard? Make dots on your slate to represent all the trees in Mr. Hale's orchard.

11. Write 5, 15, 25, and 35 in a column, and add 10 to each number.

12. Write the same column again, and add 9 to each number.

13. Write the same numbers once more, and add 8 to each.

14. The little boys skate half an hour before school in the morning, half an hour at noon, and one hour at night. How long do they skate during the day?

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LESSON XV.

1. How many months in a year?

2. Write the names of the months of the year.

3. If you do not remember them, your teacher will show you where to find them.

4. The initial letter of the name of a month is always a capital letter.

5. What is meant by initial letter? *Answer.* The initial letter is the first letter.

6. How many days in the month of January?

7. How many days in the month of February?

8. How often has February 29 days? *Answer.* February has 29 days once in 4 years.

9. What is the year called when there are 29 days in February?

10. Is this Leap Year?

11. When was the last Leap Year?

12. How many days in the month of March?

13. How many days in April? in May? in June? in July? in August? in September? in October? in November? in December?

14. How many seasons in the year?

15. Name them.

16. Should the names of the seasons begin with capital letters?

17. Which are the summer months?

18. Which are the winter months?

19. Which are the spring months?

20. Which are the fall, or autumn months?

21. Do "fall" months and "autumn" months mean the same?

22. How many months in 2 years? in 3 years? in 4 years?

23. How many weeks are there in January? *Answer.* There are 4 weeks and 3 days in January.

24. How many weeks are there in February when February has 28 days?

25. How many weeks are there in March?

LESSON XVI.

1. In Leap Year how many weeks are there in February?

2. How many months have 30 days?

3. How many months have 31 days?

4. How many more months have 31 days than have 30 days?

5. Find in the Appendix the lines beginning,

> "Thirty days hath September,
> April, June and November," etc.,

commit them to memory, and then write them from memory.

6. 7 will go in 28 how many times? 7 in 30? 7 in 31? 7 in 14? 7 in 35? 7 in 7?

$30 \div 7 = ?$ $28 \div 7 = ?$ $14 \div 7 = ?$
$31 \div 7 = ?$ $35 \div 7 = ?$ $21 \div 7 = ?$
$29 \div 7 = ?$ $42 \div 7 = ?$ $7 \div 7 = ?$

7. How many weeks in July and August?

8. When is Christmas?

9. When is New Year's Day?

10. If Christmas is on Monday, on what day of the week is New Year's Day?

11. How many days from Christmas to New Year's?

12. How many weeks from Christmas to New Year's?

13. Write the multiplication table of 8's in four forms.

14. Mr. Hudson gave 8 paint-brushes to a class of 4 pupils, giving each the same number; what fraction (part) of the whole number of brushes did each pupil have? How many brushes had each?

15. What is $\frac{1}{4}$ $\left(\frac{1}{\text{fourth}}\right)$ of 8?

16. What is $\frac{1}{4}$ of 12? of 4? of 16? of 20? of 32? of 24?

17. What time is it at noon?

18. What time is it at midnight?

19. How many hours is it from noon till midnight?

20. How many hours is it from midnight till noon?

21. What is the initial letter of a word?

22. Write the multiplication table of 4's in four forms.

LESSON XVII.

1. Write or repeat the multiplication table of 5's backward in four forms; thus:

5 times 10 are 50.	$5 \times 10 = 50$.
5 times 9 are 45.	$5 \times 9 = 45$.
etc.	etc.
10 times 5 are 50.	$10 \times 5 = 50$.
9 times 5 are 45.	$9 \times 5 = 45$.
etc.	etc.

2. Double 7, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25.

3. What number added to 15 makes 24?

4. What number subtracted from 30 leaves 25?

5. Divide 50 by 10; by 5; by 2; by 25.

6. Divide 48 by 12; by 4; by 2; by 24; by 8; by 3; by 6.

7. Multiply 9 by 5; 7 by 7; 6 by 8; 8 by 6.

8. What number multiplied by 10 gives 50?

9. What number multiplied by 10 gives ——?

10. What number multiplied by 10 produces 40?

11. What number multiplied by 10 produces 30?

12. What number multiplied by 10 produces 20?

13. Add 8, 9, 7, 4, 6, 5, and 10.

14. Subtract 9 from 15; from 25; from 35; from 45.

15. Subtract 8 from 13; from 23; from 33; from 43.

16. James bought 2 Christmas cards at 10 cents apiece, and 4 New Year's cards at 5 cents apiece. How much did they all cost?

17. What will be the fare for 6 horse-car passengers at 6 cents apiece, and 3 children who pay only half-fare?

18. Mrs. Green gave a 20-dollar bill for 3 tons of coal at 6 dollars a ton. How much change did she get?

19. Josephine took her friend into a restaurant, and ordered 2 ice-creams at 10 cents apiece, 2 cups of coffee at 10 cents apiece, and 10 cents' worth of candy to take home to her brother. How much was Josephine's bill?

20. How many fifteen-cent books can be bought for 50 cents? How many cents in change are there after paying for 3 fifteen-cent books from a 50-cent piece?

21. How many 15's are there in 50?

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LESSON XVIII.

1. Write the multiplication table of 6's as far as "6 times 8" in four forms.

2. Add 25 and 25.

3. Subtract 25 from 50.

4. Multiply 25 by 2.

5. Divide 50 by 2.

6. Divide 50 by 25.

7. How many are 25 + 25?

8. 50 divided by 25 equals how many?

9. 25 multiplied by 2 equals how many?

10. 8 from 22 leaves how many? 8 from 32? 8 from 42?

11. 6 will go in 18 how many times? 6 in 12? 6 in 24? 6 in 36?

12. 6 in 42? 6 in 48? 6 in 6? 6 in 13? 6 in 17? 6 in 25?

13. Mrs. Johnson gave Millie 48 cents with which to get 6 blocks of water-colors at 8 cents a block. Millie found that the paints were only 7 cents a block. How much money did she have left after getting 6 blocks? Millie then bought a 10-cent brush; how much of her own money did she have to use?

14. How many are 8 times 6? 6 times 8? 7 times 6? 6 times 7?

15. 42 from 48 leaves how many?

16. If a regiment of soldiers marches 9 miles in 1 day, how far can they march in 5 days?

17. If a horse travels 4 miles an hour, how far will he go in 9 hours?

18. Mr. Thomas drove his horse 36 miles one day and 32 miles the next day. He started at 9 o'clock the first morning, and drove till 10 o'clock, when he stopped one hour for dinner. He then drove from 2 o'clock till 7. How many hours was he in driving 36 miles? How far did he drive an hour? At the same rate how many hours did he drive the second

day? How much farther did he drive the first day than the second? How many more hours did he drive?

LESSON XIX.

1. What number multiplied by itself equals 4? *Answer.* 2 multiplied by itself equals 4.

2. What number multiplied by itself equals 9?
3. What number multiplied by itself equals 16?
4. What number multiplied by itself equals 25?
5. What number multiplied by itself equals 36?
6. How many are twice 2?

3 times 3?
4 times 4?
5 times 5?
6 times 6?
7 times 7?
Once 1?

7. Multiply:

6 by 6.
3 by 3.
4 by 4.
7 by 7.
2 by 2.
1 by 1.

8. Divide:

36 by 6.
1 by 1.
25 by 5.
4 by 2.
49 by 7.
9 by 3.
16 by 4.
21 by 7.
42 by 6.

9. Write the multiplication table of 6's from "6 times 8" backward, in four forms; thus:

6 times 8 are 48.
6 times 7 are 42.
etc.

8 times 6 are 48.
7 times 6 are 42.
etc.

$6 \times 8 = 48.$
$6 \times 7 = 42.$
etc.

$8 \times 6 = 48.$
$7 \times 6 = 42.$
etc.

10. How long will it take Thomas to earn 50 dollars at 5 dollars a week? How much will he have left after buying a suit of clothes for 20 dollars, a pair of boots for 5 dollars, an overcoat for 17 dollars, a hat for 2 dollars, and a pair of gloves for 1 dollar?

11. What will 6 dictionaries cost at 8 dollars apiece?

12. What will a dozen Bibles cost at 4 dollars apiece?

13. How many desks in a school-room which has 6 rows of desks and 8 desks in each row? How many would be left if one row should be taken out? If two rows should be taken out?

14. How many desks in your school-room?

15. How many less than 50 is 48? is 40? is 25? is 30? is 20? is 45? is 15? is 19?

LESSON XX.

1. Write the following questions with their answers in words; thus, 6 times 7 are? Six times seven are forty-two. $8 \times 6 = ?$ Eight multiplied by six equals forty-eight. $21 \div 3 = ?$ Twenty-one divided by three equals seven.

$12 \div 12 = ?$
15 and 15 = ?
Twice 17 = ?
$7 \times 7 = ?$
$6 \times 6 = ?$

$8 \times 5 = ?$
$6 \times 8 = ?$
$7 \times 6 = ?$
$9 \times 3 = ?$
$3 \times 9 = ?$

Twice 11 = ?
$11 + 11 + 11 = ?$
$17 \times 17 = ?$
$30 \div 2 = ?$
$42 \div 6 = ?$

48 ÷ 12 = ? 5 × 10 = ? 42 ÷ 7 = ?
20 − 8 = ? 4 × 9 = ? 48 ÷ 6 = ?
9 times 5 = ? 8 × 5 = ? 48 ÷ 8 = ?

2. How many fish-lines at 9 cents apiece could you buy for 36 cents? for 45 cents? for 27 cents? for 18 cents?

3. Take 48 counters, and place them in 4 rows. How many counters have you in a row? 48 ÷ 4 = how many?

4. Take them up, and put away 6. How many have you now?

5. Place the 42 counters in 6 rows. How many counters in a row?

6. 42 ÷ 7 = how many?

6 × 7 = ? 6 × 8 = ? 4 × 12 = ?
7 × 6 = ? 8 × 6 = ? 12 × 4 = ?

7. There are 3 feet in a yard.

8. The play-room is 36 feet long; how many yards long is the play-room?

9. 3 will go in 36 how many times?

10. 3 in 33 how many times?

3 in 27? 3 in 24? 3 in 18? 3 in 6?
3 in 30? 3 in 21? 3 in 9? 3 in 3?

LESSON XXI.

1. Divide 36 by 7 different numbers; thus:

36 ÷ 2 = 18. 36 ÷ 6 = 6. 36 ÷ 18 = 2.
36 ÷ 3 = 12. 36 ÷ 9 = 4.
36 ÷ 4 = 9. 36 ÷ 12 = 3.

The numbers 2, 3, 4, 6, 9, 12, 18, are divisors of 36.

2. Divide 24 by all its divisors.

3. Divide 48 by all its divisors, or by such as you know.

4. Divide 12 by its divisors; 20; 32.

5. Count by 7's from 7 to 49.

6. Double 15, 16, 13, 14, 19, 18, 17, 25, 12.

7. Double —, —, —, —, —.

8. Write or repeat the division table of 7's as far as "7 in 49, 7 times," in four forms; thus:

7 in 7, once.	7 ÷ 7 = 1.
7 in 14, twice.	14 ÷ 7 = 2.
7 in 21, 3 times.	21 ÷ 7 = 3.
etc.	etc.
1 in 7, 7 times.	7 ÷ 1 = 7.
2 in 14, 7 times.	14 ÷ 2 = 7.
3 in 21, 7 times.	21 ÷ 3 = 7.
etc.	etc.

9. Mrs. White took 2 dozen eggs to the store, and sold them at 2 cents apiece; how many yards of print at 6 cents a yard could she buy with her eggs?

10. Twice 12 are how many? Twice 24? 48 ÷ 6 = ? 48 ÷ 8 = ? 48 ÷ 24 = ?

11. If it takes 8 yards of print to make Anne a dress, how many dresses could be made for her from 24 yards?

12. 24 ÷ 8 = how many? 24 ÷ 3 = ? 24 ÷ 12 = ? 24 ÷ 6 = ?

13. If a train leaving Boston at 6 o'clock Monday night is 48 hours in going, when does it reach St. Paul?

LESSON XXII.

1. If a farmer owns 3 dozen hens and only one-half of them lay, how many eggs will he have daily?

2. What does "daily" mean?

3. How many days in this month?

4. How many days in 5 weeks? in 6 weeks? in 7 weeks?

5. Write the multiplication table of 7's backward from "7 times 7 are 49," in four forms.

6. How many weeks in 28 days? in 35 days? in 42 days? in 49 days?

7. If you should make 6 dots on each side of a cube, how many dots would there be on the cube?

8. If you should put 2 letters on each side of a cube, how many letters would there be on the cube?

9. How many letters are there in our alphabet?

10. Write them in capitals.

11. Which is the first letter of the alphabet?

12. How many cubes must you have to write all the letters of the alphabet, one on a side?

13. How many letters would you have for the fifth cube?

14. Which are the last two letters in the alphabet?

15. Draw a cube.

16. Place a cube on your desk. Can you see more than three sides of the cube in any one position in which you can place it?

17. How many sides of a cube can you show in a drawing?

18. Can you show 4 sides?

19. How many sides of a cube must there always be which cannot be shown in a drawing?

20. Draw a square.

21. Draw a circle.

LESSON XXIII.

1. If 10 marbles can be bought for 1 cent, how many can be bought for a five-cent piece?

2. How much is a nickel?

3. How much is a dime?

4. How much is a quarter?

5. Write the division table of 2's in four forms.

6. How many matches in 2 cards of matches if there are 18 in each card? How many days will they last if 6 matches are used every day?

7. How many dozen in 36? in 48? in 24? in 18?

8. Ben picked 7 bunches of grapes every day for a week; how many bunches did he pick in all? 13 bunches were eaten by the family, the rest were packed in boxes for market, 4 bunches in a box; how many boxes were sold? The boxes sold for 20 cents apiece; how much did each bunch bring?

9. Divide 36 by 7 divisors.

10. Multiply:

8 by 6. 6 by 7. 7 by 7. 6 by 6.

11. Add:

16 to itself.
19 to itself.
18 to itself.
17 to itself.
14 to itself.
15 to itself.
13 to itself.
24 to itself.
23 to itself.

12. Multiply:

3 by itself.
2 by itself.
4 by itself.
5 by itself.
7 by itself.
6 by itself.

13. What number multiplied by itself gives 49? 36? 25? 16? 9? 4? 1?

14. How many 11's are there in 22? in 44? in 33?

15. 30 is how many times 15? 3? 2? 10? 9? 6? 5? 8? 4? 7?

16. Write 2, 7, 3, and 9 in a column, and add them; thus:

$$\begin{array}{r} 2 \\ 7 \\ 3 \\ \underline{9} \\ 21 \end{array}$$

LESSON XXIV.

1. To find one-half of a number we divide the number by 2.

2. To find one-third of a number we divide the number by 3.

3. To find one-fourth of a number we divide the number by 4.

4. By what do we divide a number to find one-fifth of that number? By what to find one-sixth? By what to find one-seventh?

5. What is one-half of 12? *Answer.* One-half of 12 is 6.

6. What is one-third of 12? *Answer.* One-third of 12 is 4.

7. What is one-fourth of 12? What is one-sixth of 12?

8. What is one-twelfth of 12?

9. What is one-half of 10?

10. What is one-fifth of 10?

11. What is one-tenth of 10?

12. What is $\frac{1}{\text{half}}$ of 20?

13. What is $\frac{1}{\text{third}}$ of 30?

14. What is $\frac{1}{\text{fourth}}$ of 40?

15. What is $\frac{1}{\text{fifth}}$ of 50?

16. Write $\frac{1}{\text{half}}$ in figures; thus, $\frac{1}{2}$.

17. Write $\frac{1}{\text{third}}$ in figures.

18. Write $\frac{1}{\text{fourth}}$ in figures.

19. Write $\frac{1}{\text{fifth}}$ in figures.

20. Write $\frac{1}{\text{sixth}}$ in figures.

LESSON XXV.

1. What is $\frac{1}{2}$ of 38? of 36? of 28? of 32? of 34? of 24?

2. What is $\frac{1}{3}$ of 12? of 15? of 18? of 21? of 30? of 36? of 33? of 24?

3. What is $\frac{1}{4}$ of 16? of 20? of 36? of 28? of 32? of 40? of 44? of 48? of 8? of 12?

4. What is $\frac{1}{5}$ of 50? of 20? of 15? of 25? of 40? of 30? of 45? of 10? of 25? of 5?

5. What is $\frac{1}{6}$ of 12? of 36? of 18? of 24? of 48? of 42? of 30? of 6?

6. What is $\frac{1}{7}$ of 7? of 49? of 42? of 21? of 28? of 35? of 14?

7. What is $\frac{1}{8}$ of 16? of 48? of 40? of 24? of 32?

8. What is $\frac{1}{9}$ of 27? of 36? of 18? of 45?

9. What is $\frac{1}{10}$ of 50? of 40? of 30? of 20? of 10?

10. What is $\frac{1}{11}$ of 22? of 33? of 44? of 11?

11. What part of 10 is 5? *Answer.* 5 is $\frac{1}{2}$ of 10.

12. What part of 20 is 5? *Answer.* 5 is $\frac{1}{4}$ of 20.

13. What part of 12 is 6? *Answer.* 6 is $\frac{1}{2}$ of 12.

14. What part of 30 is 15? *Answer.* 15 is $\frac{1}{2}$ of 30.

15. What part of 14 is 7?

16. What part of 18 is 9?

17. What part of — is —?

18. What part of 22 is 11?

19. What part of 18 is 6?

20. What part of 24 is 12?

21. What part of 20 is 10?

22. What part of 28 is 14?

23. What part of 32 is 16?

24. What part of 16 is 4?

25. What part of 30 is 10?

26. What part of 40 is 10?

LESSON XXVI.

1. Write the ordinal numbers from "first" to "twentieth"; thus, first, second, third, fourth, etc.

2. Write them in figures; thus, 1st, 2d, 3d, 4th, etc.

3. Write the word for 2d, for 10th, for 5th, for 1st, for 3d, for 6th, for 8th, for 4th, for 25th, for 21st, for 22d, for 83d.

4. What day of the month is this?

5. Do you date your journal "January third," or "January 3d"?

6. When only a part of the letters of a word are used for the whole word, the part used is called an abbreviation.

7. An abbreviation must always have a period after it.

8. "Jan." is the abbreviation of January.

9. Write the abbreviation for February.

10. What punctuation mark is used with Feb?

11. What is the abbreviation for March? for April? for August? for September? for October? for November? for December?

12. What page of your Arithmetic is this?

13. What day of the week will to-morrow be?

14. What day of the month was yesterday?

15. Add the following:

6	9	1	2	9	1
4	3	9	7	1	9
3	8	8	9	8	3
7	1	6	4	8	4
9	8	4	8	7	2
8	2	2	8	4	7
2	6	1	1	9	1
4	7	8	5	2	3
6	4	9	4	2	4
—	—	—	—	—	—

LESSON XXVII.

1. Write the multiplication table as far as 4 times 4 in a square, in the following manner.

Write the figures from 1 to 4 inclusive, in a row; thus:

1 2 3 4

Then write the same figures, except 1, in a column under the 1 already written; thus:

1 2 3 4
2
3
4

Multiply 2 in the column of figures by 2 in the horizontal line, and place the result, which is 4, against both 2's; thus:

1 2 3 4
2 4
3
4

Multiply 3 in the column by 2 in the horizontal line, and place 6 against the two figures multiplied together; thus:

1 2 3 4
2 4
3 6
4

Multiply 4 in the column by 2 in the horizontal line, and set 8 against the two figures multiplied together; thus:

1	2	3	4
2	4		
3	6		
4	8		

Multiply 2 in the column by 3 in the line, and set 6 against the two figures multiplied together; thus:

1	2	3	4
2	4	6	
3	6		
4	8		

Multiply 3 in the column by 3 in the line, and set 9 against the figures multiplied together; thus:

1	2	3	4
2	4	6	
3	6	9	
4	8		

Multiply 4 in the column by 3 in the line, and set 12 against the figures multiplied together; thus:

1	2	3	4
2	4	6	
3	6	9	
4	8	12	

Multiply 2 in the column by 4 in the line, and set 8 against the figures multiplied together; thus:

1	2	3	4
2	4	6	8
3	6	9	
4	8	12	

Multiply 3 in the column by 4 in the line, and set 12 against the figures multiplied together; thus:

1	2	3	4
2	4	6	8
3	6	9	12
4	8	12	

Multiply 4 in the column by 4 in the line, and set 16 against the figures multiplied together; thus:

1	2	3	4
2	4	6	8
3	6	9	12
4	8	12	16

2. Have you made a perfect square?

3. How many numbers on each side of the square?

4. How many sides has a square?

5. How many numbers in a square which has 4 numbers on a side?

6. How many are 4 times 4?

7. Are there sixteen numbers in the square which you have just made?

8. Write the multiplication table as far as "5 times 5" in a square, as above.

* * *

LESSON XXVIII.

1. Add the following. Do not say to yourself "4 and 6 are 10, and 7 are 17, and 9 are 26." Say "10, 17, 26."

9	12	8	11	12	6
7	10	6	9	11	8
6	7	4	8	10	7
4	9	3	7	8	5

2. How many are 25 and 10? 25 and 9?

3. How many are 25 less 10? 25 less 9?

4. How many are 37 and 10? 37 and 9?

5. How many are 37 less 10? 37 less 9?

6. Add the following:

3	9	8	2	8	9
4	6	1	4	8	5
7	3	9	7	9	3
6	1	6	9	3	9
5	8	9	1	4	8
8	9	6	9	6	1
12	12	8	6	7	11

7. If 10 added to 17 makes 27, 9 added to 17 makes how many?

8. If 10 from 25 leaves 15, 9 from 25 leaves how many?

9. If 32 and 10 are 42, how many are 32 and 9?

10. If 36 less 10 is 26, how many is 36 less 9?

11. If 38 and 10 are 48, will 38 and 9 be 1 more or 1 less than 48?

12. If 10 from 37 leaves 27, will 9 from 37 leave 1 more or 1 less than 27?

13. Fill out the following, and give the answers.

14. How many are — times — ?

15. How many times will — go in — ?

LESSON XXIX.

1. Fill out the following, and give the answers.
2. What number is — more than — ?
3. What number is — less than — ?
4. — is how many more than — ?
5. — is how many more than — plus — ?
6. What part of — is — ?
7. How many times will — go in — ?
8. — divided by — equals how many ?
9. Add — and — and —.
10. What number added to — gives — ?
11. What number is — times — ?
12. Divide — by —.
13. — added to itself equals how many ?
14. — ÷ — = how many ?
15. How many are — times nothing ?
16. How much more is — × — than — × — ?
17. — minus — equals how many ?
18. How many more is — than twice — ?
19. Multiply — by —.
20. — ÷ — + — are how many ?
21. What remains after subtracting — from — ?
22. What number is doubled to give — ?
23. Count by 3's from — to —.
24. What number is one-half of — ?
25. Count backward from — to —.

SECTION IV. — NUMBERS ABOVE FIFTY.

LESSON I.

1. How many units in 7? in 9? in 10?

2. How many tens in 10? *Answer.* There is 1 ten in 10.

3. How many tens in 20? *Answer.* There are 2 tens in 20.

4. How many tens in 30? in 40? in 50?

5. How many tens in 60?

6. Write 61 in words; thus, Sixty-one.

7. Write the figures from 50 to 75.

8. Count backward from 75 to 50.

9. How many tens and units in 75? *Answer.* There are 7 tens and 5 units in 75.

10. How many units in 75? *Answer.* There are 75 units in 75.

11. How many units in 100? *Answer.* There are 100 units in 100.

12. Write 100 in words; thus, One hundred.

13. Write 200 in words.

14. How many units in 200?

15. How many tens in 100? *Answer.* There are 10 tens in 100.

16. How many hundreds in 100? *Answer.* There is 1 hundred in 100.

17. How many hundreds in 200? *Answer.* There are 2 hundreds in 200.

18. How many hundreds in 300? in 400? in 500?

19. How many hundreds, tens, and units in 225? *Ans.* There are 2 hundreds, 2 tens, and 5 units in 225.

20. How many units, tens, and hundreds are there in 352?

21. Count from 70 to 80, writing the numbers in words.

22. Count from 80 to 90, writing the numbers in figures.

23. Count backward from 100 to 90.

24. Write in words the following: 101, 106, 109, 110, 111, 112, 120, 119.

25. Write the multiplication table as far as "3 times 3" in a square, as in Lesson XXVII., Section 3.

LESSON II.

1. Express eighty in figures. Ninety; ninety-five; one hundred; one hundred and six; one hundred and one; two hundred; three hundred; four hundred; six hundred; five hundred and ten.

2. $56 \div 7 =$ how many? $56 \div 8 = ?$ $60 \div 10 = ?$ $64 \div 8 = ?$

3. How many are twice 20? twice 30? twice 40? twice 50?

4. $10 \times 2 = ?$ $10 \times 10 = ?$ $10 \times 5 = ?$
$10 \times 3 = ?$ $10 \times 4 = ?$ $10 \times 7 = ?$
$10 \times 6 = ?$ $10 \times 9 = ?$ $10 \times 8 = ?$

5. How many are:

20 and 10?
40 and 10?
90 and 10?
60 and 10?
30 and 10?
50 and 10?
70 and 10?
80 and 10?
100 and 10?

6. Count by 10's from 10 to 100.

7. 10 from 80 leaves how many?

10 from 70?
10 from 20?
10 from 30?
10 from 40?
10 from 50?
10 from 60?
10 from 100?
10 from 90?
10 from 120?

8. Count by 10's from 100 to 200; thus, 100, 110, 120, etc.

9. $64 \div 8 =$ how many? $64 \div 2 =$ how many?

10. How many are 8 times 8?

11. How many are 32 and 32?

12. How many are 16 and 16?

13. How many are 16 and 16 and 16 and 16?

14. How many are 4 times 16?

15. $64 \div 2 = ?$
$64 \div 4 = ?$
$64 \div 8 = ?$
$64 \div 16 = ?$
$64 \div 32 = ?$
$36 \div 2 = ?$
$36 \div 3 = ?$
$36 \div 4 = ?$
$36 \div 6 = ?$
$36 \div 9 = ?$
$36 \div 12 = ?$
$36 \div 18 = ?$

16. Count by 7's from 7 to 84; from 1 to 85; from 5 to 90.

LESSON III.

1. What is one-half of 36? *Answer.* One-half of 36 is 18.

2. What is one-third of 36? *Answer.* One-third of 36 is 12.

3. What is one-fourth of 36? *Answer.* One-fourth of 36 is 9.

4. What is one-sixth of 36?

5. What is one-ninth of 36?

6. What is one-twelfth of 36?

7. What is one-eighteenth of 36?

8. What is $\frac{1}{2}$ of 64? *Answer.* $\frac{1}{2}$ of 64 is 32.

9. What is $\frac{1}{4}$ of 64? *Answer.* $\frac{1}{4}$ of 64 is 16.

10. What is $\frac{1}{8}$ of 64?

11. What is $\frac{1}{16}$ of 64?

12. What is $\frac{1}{32}$ of 64?

13. Count by 8's from 8 to 64; from 1 to 65; from 2 to 66; from 4 to 60.

14. Count by 7's from 7 to 49; from 7 to 84.

15. Write the multiplication table as far as "6 times 6" in a square.

16. What number multiplied by itself equals 64?

17. What number multiplied by itself produces 4? produces 49? produces 36?

18. What number multiplied by itself equals 25? equals 16? equals 64?

19. On New Year's morning Walter found a box of building blocks in his chair at the breakfast table. He read on the cover "64 blocks." He counted 8 on the top when he opened the box; how many layers of blocks were there in the box?

20. 8 in 64 how many times?

8 in 16?   8 in 32?   8 in 48?
8 in 24?   8 in 40?   8 in 56?

LESSON IV.

1. Count backward from 105 to 95.

2. Subtract 10 from 100; from 20; from 110; from 105; from 95; from 102; from 92; from 106; from 96.

3. How many times will 8 go in 64?

4. How many times will 7 go in 49?

5. Take your counters, or use marks, and tell how much 9 times 9 equals.

6. How many are:

6 times 6?	4 times 4?	7 times 7?
5 times 5?	3 times 3?	9 times 9?

7. Write the multiplication table of 9's as far as "9 times 9."

8. Count by 6's from 6 to 72.

9. How many are 25 and 25?

10. How many quarters in 50 cents?

11. How many quarters in 75 cents?

12. $75 \div 25 =$ how many?

13. $75 \div 3 =$ how many?

14. How many are 25 and 25 and 25?

15. How many are 25 and 25 and 25 and 25?

16. $25 \times 4 =$ how many?

17. How many are 4 times 25?

18. How many cents in a dollar?

19. What is $\frac{1}{4}$ of 100?

20. How many dimes in 1 dollar?

21. 10 times 10 are how many?

22. $100 \div 10 =$ how many?

23. How many half-dollars in 1 dollar?

24. What is ½ of 100?

25. What part of 100 is 50?

LESSON V.

1. Express 1000 in words; thus, One thousand.

2. How many hundreds in 1000? *Answer.* There are ten hundreds in 1000.

3. How many hundreds in 2000? *Answer.* There are 20 hundreds in 2000.

4. How many hundreds in 3000? in 4000? in 5000? in 6000?

5. Add the following:

8	9	2	3	8	2	5
7	5	1	9	1	3	9
2	1	9	4	6	5	7
4	8	7	6	6	10	4
6	7	5	2	7	6	6
9	4	6	8	4	7	2
—	—	—	—	—	—	—

6. After school Don and Clarence rowed over the lake where the pond-lilies grow in abundance, and gathered all they could get before it began to grow dark. They called on their way home, and gave Susie Johnson 10 lilies; they threw away 5 which were crushed, and had 30 lilies left. How many did each have? How many did they gather?

7. The next day was Saturday, and the boys went after lilies again, and got 8 bunches, which they sold for 8 cents a bunch. Each bunch contained a dozen lilies; how many lilies in the lot? They paid Mr. Lunt 20 cents for the use of the boat; how much money did they have left? What was each one's share of the money?

8. 8 in 64 how many times?

9. 44 ÷ 2 = how many?

10. How many times will 2 go in 44?

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LESSON VI.

1. How many cents in a dollar? *Answer.* There are 100 cents in a dollar.

2. How many cents are 50 cents and 50 cents? *Answer.* 50 cents and 50 cents are 100 cents.

3. How many cents are 50 cents and 50 cents and 50 cents? *Answer.* 50 cents and 50 cents and 50 cents are 150 cents.

4. When 100 cents or more than 100 cents are considered, they are mentioned as so many dollars instead of cents. 100 cents would be called 1 dollar, and 150 cents would be called 1 dollar and 50 cents.

5. Express 125 cents in dollars and cents; 342 cents; 175 cents; 200 cents; 1000 cents (one thousand cents).

6. How many cents in 2 dollars and 40 cents? *Answer.* In 2 dollars and 40 cents there are 240 cents.

7. How many cents in 10 dollars and 25 cents?

8. The sign $ is used for dollars, and is placed before the number; thus, $2, 2 dollars; $4, 4 dollars; $6, 6 dollars; $7; $8.

This sign is a capital S placed on a capital U, and the bottom of the U omitted; thus, $, U. S. standing for United States.

9. $2 and 50 cents is written $2.50.

10. $5 and 25 cents is written $5.25; 12 cents is written $.12; 3 cents is written $.03.

11. Write $7 and 37 cents; $10 and 42 cents; $12 and 10 cents; 8 dollars and 90 cents.

12. This is called United States money because it is used in the United States.

13. Write the table for United States money.

14. You will find it in the Appendix.

LESSON VII.

1. 25 × 3 = how many?

2. What will — paper-knives cost at — cents apiece?

3. What will 2 bunches of postal-cards cost at 25 cents a bunch? *Answer.* 2 bunches of postal-cards at 25 cents a bunch will cost $.50.

4. What will 3 bunches cost at $.25 a bunch?

5. What will 4 bunches cost? *Answer.* 4 bunches of postal-cards at $.25 a bunch will cost $1 or $1.00.

6. The expressions $1 and $1.00 mean the same.

7. How many postal-cards in a bunch?

8. How many postal-cards in 2 bunches? in 3 bunches? in 4 bunches? in 5 bunches? in 6 bunches?

9. If 25 postal-cards cost 25 cents, what does 1 postal-card cost?

10. How many cents is $1.00?

11. How many cents in ½ of a dollar?

12. How many cents in ¼ of a dollar?

13. How many cents in $\frac{1}{10}$ of a dollar?

14. 100 ÷ 2 = how many?

15. 100 ÷ 4 = how many?

16. 100 ÷ 10 = how many?

17. Add the following, adding from the bottom upward, and test the work by adding from the top downward:

3	5	1	3	6	6	7
4	5	2	6	3	2	6
9	5	4	7	9	4	5
6	9	3	9	8	6	4
8	1	7	1	9	9	3
2	6	9	9	7	8	2
7	8	1	5	9	7	1
—	—	—	—	—	—	—

* * *

LESSON VIII.

1. Write the multiplication table to "8 times 8" in a square.

2. How many times is 9 contained in 81?

9 in 18?
9 in 63?
9 in 45?
9 in 54?
9 in 90?
9 in 72?
9 in 108?
9 in 99?

3. Rose went shopping and spent just $1.00 for a print dress. There were 9 yards of print at 9 cents

a yard; the rest of the money she spent for linings and a spool of cotton. The thread was 5 cents; how much was the lining?

4. How many lobsters at $.25 apiece could be bought for $1.00? for $.50? for $.75? for $1.25?

5. How many minutes are there in one hour? You will find the number of minutes in an hour in the Table of Time Measure.

6. How many minutes in ½ of an hour?

7. What is ½ of 60?

8. How many minutes in ¼ of an hour?

9. ¼ of an hour, or 15 minutes, is often spoken of as a quarter of an hour.

10. What is ¼ of 60?

11. How many minutes in ⅓ of an hour?

12. What is ⅓ of 60?

13. Divide 60 by 2; by 3; by 4; by 5; by 6; by 10; by 12.

14. 60 ÷ 2 = how many?

60 ÷ 3 = ?
60 ÷ 4 = ?
60 ÷ 5 = ?
60 ÷ 6 = ?
60 ÷ 10 = ?
60 ÷ 12 = ?
60 ÷ 15 = ?

60 ÷ 20 = ?
60 ÷ 30 = ?
75 ÷ 3 = ?
75 ÷ 5 = ?
75 ÷ 15 = ?
75 ÷ 25 = ?

56 ÷ 2 = ?
56 ÷ 4 = ?
56 ÷ 7 = ?
56 ÷ 8 = ?
56 ÷ 14 = ?
56 ÷ 28 = ?

LESSON IX.

1. Make the sign used to indicate United States money.

2. Where is United States money used?

3. Make the sign of addition.

4. Make the sign of subtraction.

5. Make the sign of multiplication.

6. Make the sign of division.

7. Make the sign of equality.

8. Remember to write every question and the entire answer.

9. 25 subtracted from 100 leaves how many?

10. 75 – 25 = how many?

11. 25 from 50 leaves how many?

12. 25 less 25 equals how many?

13. 100 minus 25 are how many?

14. 25 taken from 125 leaves how many?

15. Add the following:

9	8	7	6	11	12	8
9	8	7	6	11	12	9
9	8	7	6	11	12	7
9	8	7	6	11	12	6
9	8	7	6	11	12	5
—	—	—	—	—	—	—

16. Write the multiplication table of 9's as far as "9 times 12."

17. How many barrels of flour at $9.00 a barrel can be bought for $108.00? for $18.00? for $9.00?

18. 9 in 108 how many times?

9 in 72?
9 in 90?
9 in 54?
9 in 36?
9 in 18?
9 in 27?
9 in 81?
9 in 63?
9 in 9?
9 in 99?
9 in 45?

19. A party of 9 gentlemen went to the Lakes fishing. They each had to get new rubber boots, hat cover, and coat, which outfit cost them $11.00 apiece; how much was the whole cost?

20. What would be the cost of — umbrellas at — apiece?

LESSON X.

1. Multiply 25 by 2; by 4; by 3; by 5; by 6; by 8; by 7.

2. Multiply 17 by 10; 12 by 10; 19 by 10; 25 by 10; 14 by 10.

3. Count by 5's from 1 to 100.

4. How many 5's are there in 100?

5. How many 10's are there in 100?

6. 5 times 20 are how many?

7. 10 times 10 are how many?

8. Write 6, 17, 28, 39, 41, 50, 62, 73, 84, 95, and 100 in a column, and add 10 to each number.

9. Write the same column again, and multiply each number by 10.

10. Write the same column again, and subtract 10 from each number.

11. The little steamer, "Minnehaha," made 4 trips to the Islands one Saturday morning, and carried 25 school-children at each trip. How many children went to the Islands on the "Minnehaha"? The round trip cost $.25 apiece; how much did Addie Holt pay for herself, her sister, and their three little cousins? When they got back to town, Addie took the children home from the wharf in a horse-car.

Her own fare was 5 cents, and that of the 4 children 3 cents apiece; how much was the car-fare for the whole party? What was the cost of the whole trip for Addie and the 4 children?

12. Write the multiplication table as far as "9 times 9," in a square.

13. Add 77 and 45; thus:

$$\begin{array}{r} 77 \\ \underline{45} \\ 122 \end{array}$$

Adding the units, 7 and 5, we get 12 units. Placing the 2 units under the units added, we then add 1 ten with the tens. 1, 4, and 7 are 12 tens, which we place under the column of tens.

14. Add:

29 and 57.	13 and 92.	27 and 55.
48 and 39.	17 and 43.	19 and 14.

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LESSON XI.

1. What number is 10 less than 100?
2. What number is 15 more than 30?
3. What is the amount of 16, 17, 18, and 19?
4. 29 — 12 leaves what remainder?
5. 75 is how many more than 65?
6. What part of 60 is 30?
7. What is the sum of 9, 10, 11, and 12?
8. 80 is how many less than 100?
9. How many times 15 in 75?

10. 45 is how many times 15?

11. Find the sum of 20, 30, 40, 50, 60, 70, 80, 90, and 100.

12. Add the following:

273	567	806	2095
142	392	975	3167
986	689	190	4251

13. How many more is 200 than 125?

14. What part of 400 is 200?

15. Subtract 15 from 30; 18 from 36; 50 from 100; 25 from 75.

16. Divide 49 by 7; 64 by 8; 144 by 12; 121 by 11; 100 by 10; 81 by 9.

17. Multiply 20 by 5; 15 by 4; 16 by 2; 25 by 8; 8 by 7; 9 by 6.

18. Add the following:

345980	40321	86754
791208	94870	2451
637055	29187	7653
426313	51992	9137
987147	31547	4286
686937	86592	567
295760	56785	191

LESSON XII.

1. Multiply 0 by 17.

2. What number is doubled to get 38?

3. What is ½ of 5?

4. What is ½ of 1?

5. If Carrie can write one lesson in Arithmetic in 2 days, what part of a lesson can she write in one day?

6. What is ½ of 25? of 17? of 75? of 100? of 300?

7. How many feet around a hall 70 feet long and 40 feet wide?

8. George spends ½ dollar every day for dinner at the restaurant; how much does he spend in 3 days?

9. Express 1½ dollars by means of the sign of U. S. money.

10. Add together two numbers containing ten places each; thus:

$$\begin{array}{r}
6379564899 \\
3604275980 \\
4983840879 \\
\hline
\end{array}$$

11. Add six numbers containing three places each.

12. Add fifteen numbers containing two places each.

13. Add nine numbers containing four places each.

14. Add all the examples given in your Elementary Arithmetic under Addition.

LESSON XIII.

1. There are 24 sheets of paper in a quire; what part of a quire did Miss True use in writing 6 letters, for each of which she used 2 sheets? What part of

the quire was left? How many sheets were left? How many sheets did Miss True use for her 6 letters?

2. What number added to itself equals 40? 36? 50? 100? 32? 28? 38? 30? 34? 26? 22? 44?

3. What number multiplied by itself equals 16? 9? 64? 25? 4? 36? 81?. 100? 49?

4. Learn the product of 11 multiplied by 11; 12 multiplied by 12.

5. Write the multiplication table of 11's to "11 times 12 are 132."

6. Warren is learning to use carpenter's tools, and is making his mother a light bass-wood cutting-board to use on her lap. It is to have a yard-measure on the straight edge, which is just 1 yard long; into how many feet is it divided? Into how many inches is each foot divided? How many inches long is the cutting-board? How many feet long? How many yards long?

7. How many feet in 1 yard?

8. How many inches in 1 foot?

9. How many inches in 1 yard?

10. How many inches in 5 feet? in 4 feet? in 12 feet? in 11 feet?

11. Mr. Cummings used a ten-foot pole in building his fence; how many inches long was his measure? How much longer was it than Mrs. Cummings' yard-measure? How many yards long was Mr. Cummings' ten-foot pole?

12. How many yards in 10 feet?

13. How many yards in 15 feet? in 30 feet? in 20 feet?

14. How many feet in:

24 inches? in 30 inches? in 36 inches?
in 144 inches? in 132 inches? in 48 inches?
in 60 inches? in 72 inches? in 84 inches?
in 27 inches? in 28 inches? in 29 inches?

15. By what table is distance in feet and inches measured?

16. Write the table of Long Measure.

17. Write the multiplication table of 11's backward.

LESSON XIV.

1. 12 in 132 how many times?

2. 11 in 121 how many times?

3. 10 in 100 how many times?

4. 12 subtracted from 84 equals how many?

5. Write the multiplication table of 12's to "12 times 12."

6. Write the multiplication table as far as "8 times 8" in a square.

7. How much does it cost to register 5 letters at $.10 apiece?

8. Does a registered letter require a 2-cent postage-stamp?

9. If a registered letter is overweight, what is the cost of sending it, only the 2-cent postage being doubled?

10. The night before Christmas Mr. Day sold 1 dozen sets of toy dishes, 2 dozen dolls, 1 dozen doll's cradles, 3 dozen tops, and 5 dozen other toys; how many toys did Mr. Day sell on Christmas eve?

11. Add the following:

3426	13122	9269478
8676	5486	7984109
7191	7575	8363744
9191	9104	9217437
4647	4369	2569897

12. Add one hundred and thirty-two to four hundred and sixty-seven.

13. Add the following:

36786794	4821864529
94282007	3962079481
46759371	4873981873
32168279	1020432164

* * *

LESSON XV.

1. Write the multiplication table to "9 times 9" in a square.

2. Multiply 123 by 2; thus,

$$\begin{array}{r}123\\ 2\\ \hline 246\end{array}$$

3. Multiply 342 by 2; 424 by 2; 634 by 2.

4. Multiply 167 by 2; thus,

$$\begin{array}{r}167\\ 2\\ \hline 334\end{array}$$

Twice 7 units are 14 units, or 4 units and 1 ten. Twice 6 tens are 12 tens, and 1 ten are 13 tens, or 3 tens and 1 hundred. Twice 1 hundred are 2 hundreds, and 1 hundred are 3 hundreds.

5. Mr. Perkins, the hardware dealer, bought 6 dozen pairs of skates at $2 a pair; 3 dozen pairs at $3 a pair; and 5 dozen pairs at $1 a pair; how many pairs of skates did he buy? How much did they all cost him?

He sold the 2-dollar skates for $3 a pair; the 3-dollar skates at $4 a pair; and the dollar skates at $2 a pair; how much did he get for them all? How much did he make on the 14 dozen pairs of skates?

Mr. McDonald bought 3 pairs for his boys, 1 of each kind; how much did he pay for the skates, and for three sleds at $4 apiece?

6. Add the following:

91264	63213	41063123
74797	95947	98758370
88348	87069	88942924
91069	83756	93739868
67959	21004	12797181

7. Multiply the following:

3621	7463	9174	8447	3718
2	3	3	2	4

8. How many units, tens, and hundreds are there in 947? in 802? in 566? in 213?

9. Give all the pairs of numbers which added together make 15; which make 11; which make 8.

LESSON XVI.

1. Subtract 20 from 50; thus, 50 − 20 = 30.

2. Subtract:

30 from 40.
20 from 70.
90 from 100.
30 from 80.
80 from 90.
40 from 80.
70 from 100.
20 from 90.
60 from 70.
80 from 100.
30 from 90.
50 from 50.

3. Subtract 200 from 400. 400 − 200 = 200.

4. Subtract:

200 from 600.
300 from 900.
900 from 1000.
300 from 700.
600 from 900.
800 from 1000.
300 from 500.
800 from 900.
100 from 900.

5. 144 ÷ 12 = ?
132 ÷ 12 = ?
48 ÷ 12 = ?
84 ÷ 12 = ?
72 ÷ 12 = ?
60 ÷ 12 = ?
24 ÷ 12 = ?
36 ÷ 12 = ?
108 ÷ 12 = ?
12 ÷ 12 = ?
120 ÷ 12 = ?
96 ÷ 12 = ?
11 ÷ 11 = ?
44 ÷ 11 = ?
132 ÷ 11 = ?
55 ÷ 11 = ?
33 ÷ 11 = ?
22 ÷ 11 = ?
66 ÷ 11 = ?
77 ÷ 11 = ?
88 ÷ 11 = ?
110 ÷ 11 = ?
99 ÷ 11 = ?
121 ÷ 11 = ?
120 ÷ 10 = ?
20 ÷ 10 = ?
30 ÷ 10 = ?
110 ÷ 10 = ?
50 ÷ 10 = ?
90 ÷ 10 = ?
80 ÷ 10 = ?
100 ÷ 10 = ?
40 ÷ 10 = ?
60 ÷ 10 = ?
70 ÷ 10 = ?
10 ÷ 10 = ?

6. Gustave, the gardener, had 90 strawberry plants. He wished to use only as many as he could set in a square; how many rows did he set, and how many plants in a row? The plants which were left he gave to Edward for his garden; how

many plants did Edward have? Could Edward set his plants in a square?

7. Make dots on your slate representing Edward's strawberry patch. How many are 9 times 9? 3 times 3? 81 from 90? 100 – 20?

LESSON XVII.

1. When only a part of a word instead of the whole word is written, what do we call the part written?

2. Abbreviate Sunday, Monday; abbreviate all the days of the week.

3. What point must be written after every abbreviation?

4. How many days in 12 weeks? in 11 weeks? in 10 weeks? in 9 weeks?

5. How many weeks:

in 84 days?
in 49 days?
in 42 days?
in 14 days?
in 21 days?
in 35 days?
in 28 days?
in 56 days?
in 7 days?

6. How many week-days:

in 6 weeks?
in 10 weeks?
in 12 weeks?
in 11 weeks?
in 9 weeks?
in 8 weeks?
in 7 weeks?
in 5 weeks?
in 4 weeks?

7. Write the multiplication table of 7's backward.

8. Write the table of Time Measure.

9. How many hours in a day?

10. Multiply 24 by 60; thus:

$$\begin{array}{r}24\\60\\\hline 1440\end{array}$$

11. How many minutes in 24 hours?

$$\begin{array}{rl} & 24\ \text{times}\\ & 60\ \text{minutes.}\\\hline \textit{Answer.} & 1440\ \text{minutes in 24 hours.}\end{array}$$

12. How many seconds in an hour, or 60 minutes?

$$\begin{array}{rl} & 60\ \text{times}\\ & 60\ \text{seconds.}\\\hline \textit{Answer.} & 3600\ \text{seconds in 60 minutes, or an hour.}\end{array}$$

Multiply 13425 by 22;

$$\begin{array}{r}13425\\22\\\hline 26850\\26850\\\hline 295350\end{array}$$

13. Multiply 25 by 2.

14. Multiply 25 by 3; by 4; by 5; by 6; by 7; by 8.

15. Multiply:

15 by 2. 17 by 2. 19 by 2.
16 by 2. 18 by 2. 13 by 2.

16. What is:

$\frac{1}{2}$ of 40? $\frac{1}{2}$ of 38? $\frac{1}{2}$ of 26?
$\frac{1}{2}$ of 36? $\frac{1}{2}$ of 34? $\frac{1}{2}$ of 28?

17. Subtract 10 from 105; from 115; from 121; from 136. 19 from 36 leaves how many? 14 from 28?

LESSON XVIII.

1. Write 1109 in words; thus, one thousand one hundred and nine.

2. Write 25,000 in words; 26,000; 28,000; 55,000; 10,000.

3. Write one hundred in figures; one hundred thousand; seventy-six thousand; one hundred and sixty-seven thousand.

4. Multiply 137942 by 23.

5. Add 1374 and 9846.

6. Add 137946, 327941, and 684321.

7. 18 is 18 more than how many?

8. 18 is 18 less than what number?

9. Count by 12's from 12 to 144.

10. 9 in 81, 9 times.
9 in 108?
9 in 63?
9 in 54?
9 in 99?
9 in 18?
9 in 27?
9 in 90?
9 in 45?
9 in 72?
9 in 36?
9 in 9?

8 in 16, twice.
8 in 64?
8 in 96?
8 in 88?
8 in 8?
8 in 24?
8 in 32?
8 in 56?
8 in 40?
8 in 80?
8 in 48?
8 in 72?

7 in 7, once.
7 in 84?
7 in 70?
7 in 14?
7 in 77?
7 in 21?
7 in 63?
7 in 56?
7 in 28?
7 in 35?
7 in 42?
7 in 49?

11. How many dozen copy-books could you buy for $1.44 at 12 cents apiece?

12. Miss Carter paid 11 cents apiece for blank-books for her class of 11 pupils, getting one for each of the class and one for herself; how much did the blank-books cost? How many blank-books did she get?

LESSON XIX.

1. What number will go twice in 50? in 100? in 200? in 400?

2. What number will go 4 times in 100? in 400?

3. What number will go twice in 1000? in 2000? in 4000?

4. What number is doubled to give 50? to give 100? to give 1000? to give 2000? to give 4000? to give 8000?

5. What is one-half of 50? one-half of 100? one-half of 1000? one-half of 4000? one-half of 8000?

6. How many are twice twenty-five? twice fifty? twice one hundred? twice two hundred? twice three hundred? twice four hundred? twice five hundred? twice six hundred? twice one thousand?

7. Multiply 36421 by 234.

$25 \times 2 = ?$
$25 \times 4 = ?$
$25 \times 3 = ?$
$25 \times 1 = ?$
$25 \times 5 = ?$
$25 \times 6 = ?$
$25 \times 7 = ?$
$25 \times 8 = ?$

$100 \div 25 = ?$
$125 \div 25 = ?$
$50 \div 25 = ?$
$25 \div 25 = ?$
$75 \div 25 = ?$
$150 \div 25 = ?$
$175 \div 25 = ?$
$200 \div 25 = ?$

3 times 25 = ?
twice 25 = ?
4 times 25 = ?
6 times 25 = ?
8 times 25 = ?
7 times 25 = ?
once 25 = ?
5 times 25 = ?

8. Mr. King took 9 boxes of honey from each of

7 hives of bees during the summer; how many boxes of honey did he have?

9. He sold some of the honey at 80 cents a box; at this rate how much did he get for 50 boxes?

50 times
80 cents.
Answer. $40.00 for 50 boxes.

10. How many boxes of honey were left after selling 50 boxes?

11. 50 from 63 leaves how many?

12. 63 – 50 =? 63 – 10 =? 63 – 13 =? 63 – 53 =?

* * *

LESSON XX.

1. What number divided by 4 equals 25?

2. What number multiplied by 11 equals 121?

3. How long would it take you to travel 1000 miles if you should travel 200 miles a day?

4. If you travelled day and night by express train, and should go 500 miles a day, how many days would it take you to travel 1000 miles?

5. 1000 ÷ 200 = how many?

6. 1000 ÷ 500 = how many?

7. 1000 ÷ 2 = how many?

8. Add the following:

369542	446031	379145
681065	716497	687471
324317	821338	279148
562785	192749	624368

9. How far will a steamship go in 7 days, at 375 miles a day?

10. Do you know about how many days it takes a steamer to cross the Atlantic from New York to Liverpool?

11. If a steamer takes just 8 days from New York to Liverpool, making 375 miles a day, what is the distance?

12. $375 \times 7 = 2625$; $375 \times 8 = ?$

13. Multiply 3641 by 342.

14. If an express train starting from Boston runs 300 miles a day, for 8 days, between Boston and San Francisco, what distance is the train from Boston at the end of that time?

$$\begin{array}{rl} 8 & \text{times} \\ \underline{300} & \text{miles.} \end{array}$$

The train is 2400 miles from Boston.

How far is the train from San Francisco?
$3200 \div 400 =$ how many? $2400 \div 8 = ?$

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LESSON XXI.

1. What number is 1 less than 1?
2. What number is 10 less than 10?
3. What number is 1 more than 1?
4. What number subtracted from 25 leaves 0?
5. What number added to itself gives 100?
6. What number multiplied by itself gives 1?
7. How many times will 5 go in 3 times 20?

8. What part of 50 is 25? of 100 is 50? of 24 is 12? of 48 is 24? of 32 is 16? of 36 is 18? of 44 is 22? 10 is what part of 20? 15 is what part of 30? 75 is what part of 150? 69 is what part of 138?

9. What is 23 less than 23?

10. 15 will go in 15 how many times? 10 in 10? $37\frac{1}{2}$ in $37\frac{1}{2}$?

11. Multiply 15 by 1; 1 by 1.

12. Divide 15 by 1; 1 by 1.

13. Add 1 to 15; 1 to 1.

14. Subtract 1 from 15; 1 from 1.

15. Once 1 is how many? once 15? once 25? once 0?

16. John sold 200 old newspapers for 25 cents a hundred; how much did he get for them? He gave $\frac{1}{2}$ of the money to his little sister Kate; how much did he have left, and how much did Kate get?

17. Robert told his father that if he had 5 cents more, he should have enough to buy a one-dollar harmonica; his father then gave him a quarter. How much money had Robert at first? How much had he left after buying the harmonica? How much had he after his father gave him the quarter, and before he bought the harmonica?

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LESSON XXII.

1. How many units, tens, and hundreds in 364? in 103? in 125? in 275? in 397; in 564? in 200? in 643? in 450?

2. How many dozen in 200?

3. Add $(3 + 9 + 7) \div 2$ to $9\frac{1}{2}$.

$3 + 9 + 7$ are 19.
$19 \div 2 = 9\frac{1}{2}$.
$9\frac{1}{2} + 9\frac{1}{2} = 19$.

4. Divide $(3 + 7) \times 9$ by 2.

5. Count by 25's from 25 to 1000.

6. 20 is how many times as great as 5?

7. 100 is twice what number? 4 times what number? 5 times what number?

8. What is 30 less than 30?

9. What is 6 more than 24?

10. How many more is 65 than 45?

11. How many less is 45 than 50?

12. 90 is how many less than 9 times 9.

13. What number is 20 more than 80?

14. How many sides has a square?

15. How many sides has a cube?

16. If one side of a square lot is 20 rods long, how many rods of fence are required to fence the four sides of the lot? Make a drawing of the lot on your slate, showing the length of the fence in figures. If only 3 sides of the lot are fenced, how many rods remain unfenced? How many rods of fence have the 3 sides? How many square rods in the above lot?

17. Write and perform a problem for yourself, in which 23 is divided by 3, leaving 2 for a remainder; *e.g.*, John divided 23 peaches equally among 3 children; how many peaches did they each have, and how many had John left? *Answer.* The children had each 7 peaches, and John had two peaches left.

18. Write another, in which you have $20 \div 5 + 4$.

LESSON XXIII.

1. Subtract 32467 from 46869.

46869
32467
Answer. 14402

2. Subtract 136 from 254.

254
136
Answer. 118

We cannot subtract 6 units from 4 units, so we take 1 ten from 5 tens; this one ten, which is 10 units, added to the 4 units, makes 14 units, and 6 units subtracted from 14 units gives 8 units. 3 tens from the remaining four tens leaves 1 ten, and 1 hundred from 2 hundreds leaves 1 hundred.

3. In the same way as the above subtract:

265 from 484   662 from 836   103 from 360
397 from 598   47 from 81

4. 9 in 19 how many times? *Answer.* 9 in 19, twice and 1 over.

9 in 27? *Answer.* 9 in 27, 3 times.
9 in 36? *Answer.* 9 in 36, 4 times.
9 in 40? *Answer.* 9 in 40, 4 times and 4 over.

9 in 72?
9 in 81?
9 in 85?
9 in 90?
9 in 95?

8 in 64?
8 in 16?
8 in 20?
8 in 24?
8 in 72?

7 in 84, 12 times.
7 in , twice.
7 in , 3 times.
7 in , 8 times.
7 in , 11 times.

9 in 99?
9 in 54?
9 in 63?
9 in 108?
9 in 18?
9 in 45?
9 in 9?

8 in 32?
8 in 40?
8 in 96?
8 in 64?
8 in 48?
8 in 25?
8 in 18?

7 in , 4 times.
7 in , 10 times.
7 in , 9 times.
7 in , once.
7 in , 5 times.
7 in , 6 times.
7 in , 7 times.

5. What is the difference between 8 times 1 and 9 times 1? *Answer.* 8 times 1 is 1 less than 9 times 1.

6. What is the difference between 3 times 12 and twice 15?

7. What is the difference between 5 times 5 and 3 times 8?

8. What is the difference between 40 ÷ 8 and 35 ÷ 5?

9. What is the difference between 25 − 8 and 3 times 5?

LESSON XXIV.

1. What is the difference between 9 and half a dozen?

2. How many are one dozen and a half?

3. What will a dozen and a half of tomatoes cost at 2 cents apiece?

4. When radishes are 6 cents a dozen what will half a dozen cost?

5. What is $\frac{1}{2}$ of 8? of 16? of 14? of 28? of 20? of 30? of 40? of 50? of 48? of 32? of 36? of 24? of 38? of 100? of 1000? of 12? of 60?

6. Alexander went to the coal-dealer's with his little cart, and hauled home 12 fagots or bundles of kindling wood. Each bundle contained 12 sticks; how many sticks in all? What did it cost at 5 cents a bundle? How many days will it last if Bridget uses 6 sticks every morning in kindling the kitchen fire? How many weeks? If Alexander took a 5-dollar bill to the coal-dealer's with which to pay for the kindling wood, how much change did he get?

7. Divide 2846 by 2;

$$\begin{array}{r} 2\underline{)2846} \\ 1423 \end{array}$$

thus, 2 in 2, once; 2 in 8, 4 times; 2 in 4, twice; and 2 in 6, 3 times.

8. Divide 9639 by 3; 84,646 by 2; 10,884 by 2.

9. Divide 274 by 2; thus,

$$\begin{array}{r} 2\underline{)274} \\ 137 \end{array}$$

2 in 2, once; 2 in 7, 3 times and 1 over; 2 in 14, 7 times.

10. Divide 3689 by 2. 47132 by 2. 436962 by 3.

11. Multiply 6847 by 223. 8467 by 451. 9487 by 982.

12. Subtract 3468 from 8271; 118 from 23567.

13. Add:

36481	23465	56894
97867	68981	17948
57896	45971	64375
69718	32137	73124

LESSON XXV.

1. Write one hundred thousand in figures.

2. In the "Common School Arithmetic" find "Notation and Numeration." Find the "Numeration Table" showing the periods into which numbers are separated.

3. What is the name of the first period on the right? *Answer.* The first period on the right is units.

4. What is the name of the second period?

5. How many figures in a period?

6. Write seven hundred thousand in figures.

7. In reading a number is each period named? *Answer.* Each period is named except units.

8. Do you say "three hundred and seventy-five units" for 375?

9. What is the name of the third period?

10. Write one hundred million in figures; one hundred billion.

11. Write the multiplication table as far as "12 times 12" in a square.

12. Multiply 3648917 by 2431.

13. Divide 2464 by 2; 318927 by 3; 168132 by 2; 168132 by 4.

14. Subtract 32417 from 419282; 63487 from 91298.

15. Do you add, subtract, or divide to find the number of weeks in 365 days?

16. If vinegar is 40 cents a gallon, how much must be paid for three quarts?

17. How many quarts in a gallon?

18. Have you a quart measure and a pint measure? If so, see how many times you must fill the pint measure with water, and empty it into the quart, in order to fill the quart measure. Tell how many times you had to fill the pint measure, or how many pints there are in a quart.

19. By what table is vinegar measured?

20. Write or repeat the table of Liquid Measure.

LESSON XXVI.

1. Make fifteen ciphers; point them off, by commas, into periods of three ciphers each; connect the figures of each period by a line over the top, and write the names of the period above:

Trillions.	Billions.	Millions.	Thousands.	Units.
000,	000,	000,	000,	000.

2. Write or recite the table of Liquid Measure; of Long Measure; of Time Measure; of United States Money.

3. Write a number containing six figures, and multiply it by 5.

4. Divide 36487210 by 3; by 5; by 6; by 4.

5. Double 19, 18, 17, 16, 15, 14, 13, 12, 25, 50.

6. What is:

$\frac{1}{2}$ of 100? $\frac{1}{3}$ of 300? $\frac{1}{5}$ of 50?
$\frac{1}{2}$ of 300? $\frac{1}{4}$ of 400? $\frac{1}{5}$ of 500?

7. If potatoes are a dollar a bushel, what will one peck cost?

8. How many pecks in a bushel?

9. By what table are potatoes measured?

10. Write or recite the table of Dry Measure.

11. How many quarts make a peck, Dry Measure?

12. How many quarts make a gallon, Liquid Measure?

13. Are the quarts of Liquid and Dry Measure the same? You will find this in the Appendix.

14. Which is the larger, a quart Dry Measure or a quart Liquid Measure?

15. 36 ÷ 9 = ?
36 ÷ 12 = ?
36 ÷ 2 = ?
36 ÷ 4 = ?
36 ÷ 3 = ?
36 ÷ 6 = ?

24 ÷ 3 = ?
24 ÷ 4 = ?
24 ÷ 6 = ?
24 ÷ 8 = ?
24 ÷ 12 = ?
24 ÷ 2 = ?

48 ÷ 4 = ?
48 ÷ 6 = ?
48 ÷ 8 = ?
48 ÷ 16 = ?
48 ÷ 12 = ?
48 ÷ 24 = ?
48 ÷ 2 = ?
48 ÷ 3 = ?

LESSON XXVII.

1. Count by 12's from 12 to 144.

2. Write or repeat the multiplication table of 6's in four forms.

3. How many 20's in 100?

4. 20 units make 1 score, and 12 units make 1 dozen; how many score in 5 dozen?

5. In what book are the ages of people often expressed by scores of years?

6. How many are 2 score? 3 score? 5 score? 4 score and ten?

7. Find the book of Daniel in your Bible, and read the 31st verse of the 5th chapter. In this verse you learn that the Chaldean king, Darius, was three score and ten years old when he took the kingdom. Can you tell how old he was? How much less than 100 years old was he?

8. Has your age reached a score of years?

9. How many years before you will be three score and ten?

10. Multiply a number containing 6 figures by a number containing 3 figures.

11. Write or recite the division table of 11's in four forms.

12. Double 20, 30, 40, 50, 60, 70, 80, 90, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000.

13. Subtract 3 times 5 from 20.

14. Multiply twice 10 by 4 times 5.

15. How many are 25 and 50 and 25 and 25 and 75?

16. Multiply 20 by 5; 25 by 4; 40 by 2; 30 by 3.

17. What number multiplied by itself produces 400?

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LESSON XXVIII.

1. Write 12 numbers, all larger than 5, in a column, and multiply each by 2.

2. Write 10 numbers, all larger than 3, and multiply each by 3.

3. Count backward by 10's from 200 to 100.

4. Write the ordinal numbers in figures from 1st to 15th.

5. Add 8 to each of the numbers from 7 to 20.

6. Write the division table of 12's in four forms.

7. What is $\frac{1}{7}$ of 368974? $\frac{1}{8}$ of 657872? $\frac{1}{9}$ of 917866?

8. If an ounce of gold is worth $20, what is the value of a pound of gold?

9. By what weight is gold weighed?

10. Write or recite the table of Troy Weight.

11. By what weight is sugar weighed?

12. Write or repeat the table of Avoirdupois Weight.

13. In which weight has the pound 12 ounces?

14. Which pound is heavier, the pound Troy or the pound Avoirdupois?

15. Which is heavier, a pound of gold or a pound of coffee?

16. How many ounces in 100 pounds Troy?

17. How many ounces in 100 pounds Avoirdupois?

18. How do you find one-half of anything? *Answer.* I find one-half of anything by dividing it into two equal parts.

Remember throughout the book always to write each question, and to write the answer in full. In all problems write out the entire statement in the answer.

19. How do you find one-half of a number? *Answer.* I find one-half of a number by dividing the number by 2.

20. Find in your Geography the population of Maine, of New Hampshire, of Vermont, of Massachusetts, of Rhode Island, and of Connecticut. Add these numbers, and tell the population of New England.

21. How many more days are there in March than in April?

22. How much more will a span of horses cost at 250 dollars apiece, than a span at 175 dollars apiece?

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LESSON XXIX.

1. Numbers which can be divided by 2 without a remainder are called even numbers.

2. Numbers which cannot be divided by 2 without a remainder are called odd numbers.

3. Why is 4 an even number? *Answer.* 4 is an even number because it can be divided by 2 without a remainder.

4. Why is 7 an odd number?

5. Why is 11 an odd number?

6. Is 9 an even or an odd number? is 8? 6? 12? 15? 13? 14? 10? 16? 19? 22?

7. Write the even numbers from 2 to 20; thus, 2, 4, 6, etc.

8. Write the odd numbers from 1 to 25.

9. Is 35 odd or even? 40? 75? 100? 1000?

10. Which is 22? Which is thirty-seven? forty-eight? twelve? fifty?

11. Give one-half of all the even numbers from 2 to 26; thus, 1 is $\frac{1}{2}$ of 2; 2 is $\frac{1}{2}$ of 4; 3 is $\frac{1}{2}$ of 6.

12. Give ½ of all the even numbers from 40 to 50.

13. Write the odd numbers from 70 to 90.

14. How many even numbers are there in 20? in 50? in 100?

15. Multiply three hundred and twenty-four million, one hundred and twenty-five thousand, six hundred and eighty-six, by twenty-three.

16. Write the following numbers in figures, writing the name of each period; thus, 36124276321, 36 billion, 124 million, 276 thousand, 321; 464317128; 26843567842; 48976481321.

17. Write all the numbers in your "Common School Arithmetic," under "Notation and Numeration."

18. How much more will a dozen pairs of overshoes cost at $1.00 a pair than at $0.75 a pair?

LESSON XXX.

1. Divide 364575 by 5; 875943 by 3; 67944 by 6; 956743 by 7; 811856 by 8; 3942781 by 9.

2. Multiply a number containing 4 figures by 9.

3. Multiply the same number by 7.

4. Subtract 3648 from 12137; 8179 from 64285.

5. Add:

17 to itself. 18 to itself. 15 to itself.
14 to itself. 19 to itself. 16 to itself.

6. What number multiplied by itself produces 144? 121? 100? 64?

7. Write the multiplication table as far as "11 times 11" in a square.

8. Count from 195 to 205, writing the numbers in words.

9. Count by 10's from 50 to 150.

10. Robert saw in the harbor, one day, eight row-boats, five small fishing-smacks, two pleasure-yachts, the Charleston steamer, seven large sailing-vessels, one trans-Atlantic steamer, the "Minnehaha," and a ferry-boat; how many boats did he see? A strong wind sprang up, when the fishing-smacks and row-boats ran in shore; how many boats were then left in the harbor?

11. Add 1000, 75, 120, 129, 64, 8000, and 576.

12. Subtract 18 from 100, and prove the work; thus, $100 - 18 = 82$. *Proof.* $18 + 82 = 100$.

13. Subtract 20 from 75, and prove the work.

14. How do you find one-half of a number?

15. How do you find one-third of a number?

16. How do you find one-fourth of a number?

17. How do you find one-fifth of anything?

18. How do you find one-fifth of a number?

19. To find one-half of anything, divide it into 2 equal parts. To find one-half of a number, divide the number by 2.

LESSON XXXI.

1. You have noticed that the hands of a clock are not of the same length; the long hand is called the minute-hand, and the short hand is the hour-hand.

What time is it when the hour-hand is at 3 and the minute-hand is at 12?

2. Draw a circle to represent the face of a clock. The face of the clock is called the dial. How many hours are represented on the dial? Write the numbers in their proper places, using figures if you do not know the Roman letters, which stand for numbers.

3. How many minutes are represented on the dial? Are they represented by figures? How are they represented?

4. How long does it take the hour-hand to move once around the dial? How long does it take the minute-hand to move once around the dial?

5. Is there a second-hand on your school-room clock?

6. Does the second-hand move around the same circle with the other hands?

7. How long does it take the second-hand to move around its circle?

8. How many times does the second-hand move around the circle in one minute? How many times in an hour?

9. How many times does the minute-hand move around the dial in one hour?

10. Does the hour-hand move around the dial every hour?

11. How many hours does it take the hour-hand to move once around the dial?

12. Draw a dial with the hands at 6 o'clock; another, with the hands at 7 o'clock.

13. Write or recite the table of Time Measure.

LESSON XXXII.

1. How many days are there in a score of years?

2. Write 1884 in words.

3: How many days from June 1st to Aug. 1st?

4. Write the multiplication table in a square, as far as "10 times 10."

5. Divide 757500 by 12; thus,

```
12)757500
    63125
```

and thus:

```
12)757500(63125
   72
    37
    36
     15
     12
      30
      24
       60
       60
```

6. The former process is called Short Division, and the latter Long Division.

7. Divide 34573 by 11, by Short Division.

8. Divide 67489 by 15, by Long Division; thus:

```
15)67489(4499 4/15
   60
    74
    60
    148
    135
     139
     135
       4 remainder.
```

9. Edward boards half a mile from school, and has a morning and afternoon session; how far does he walk daily? How far does he walk in the morning? How far at noon? How far in one week?

10. How much is twice one-half?

11. How many halves in a unit?

12. How many units in 2 halves?

13. How many units:

in 3 halves?
in 5 halves?
in 7 halves?
in 6 halves?
in 10 halves?
in 20 halves?

14. How many miles in 11 half-miles? in 2 half-miles?

15. How many dollars in 15 half-dollars?

LESSON XXXIII.

1. Take in your hand one dollar in quarters.

2. How many dollars have you in your hand?

3. How many quarters?

4. How many quarters make a dollar?

5. How many quarters in 2 dollars?

6. How many dollars in 4 quarters? in 8 quarters? in 10 quarters? in 7 quarters? In 7 quarters there are 1 dollar and 3 quarters.

7. How many dollars in 9 quarters? in 12 quarters? in 20 quarters?

8. How many units in 4 quarters?

in 4 fourths?
in 8 fourths?
in 7 fourths?
in 11 fourths?
in 12 fourths?
in 20 fourths?

9. How many minutes in 1 hour? in ½ of an hour? in ¼ of an hour?

10. What is ½ of 60? ¼ of 60? $\frac{1}{12}$ of 60? ⅓ of 60?

11. Write 1½ dollars with the sign of U.S. money; thus, $1.50.

12. Write 1¼ dollars; 1¾ dollars; 2½ dollars; 3¾ dollars; 5½ dollars.

13. Write two dollars and a half in figures and signs; one dollar and a quarter; three dollars and three quarters; ten dollars and a half; one hundred and five dollars and sixty cents.

14. Hugh is a dozen years old; his brother Elliot is 15 years old, and Arthur is 1 score and 1; which is the eldest? Which is the youngest?

15. What do you recall that is almost always computed by dozens?

16. Do you often use the word "score"? Where have you oftenest read it?

17. Divide 364891 by 14; 8971076 by 7, by Short Division.

18. Subtract 1348907 from 8678410356.

19. Draw the face of the clock with the hands at half-past 3.

LESSON XXXIV.

1. How many Roman letters are used to express numbers?

2. Write the Roman letters used to express numbers.

3. For what does X stand? V? I? L? M? D? C?

4. Write the letter which stands for 1; for 5; for 10; for 50; for 100.

5. Count from 1 to 20, writing the numbers in Roman capitals.

6. Write in figures XXVIII, XL, V, VI, IV, VIII, III, XI, XV, XVI, C.

7. Write in Roman numerals 21, 18, 16, 25, 40, 12, 8, 118, 200, 90.

8. Write in figures MDCCCLXXXIV.

9. When plums are 6 cts. a doz., how much are they apiece?

10. When peaches are 24 cents a dozen, how much apiece are they?

11. When quinces are 1 cent and a half apiece, how much are they a dozen?

12. If Thomas gets $.25 for making one wall-bracket, how much would he get for 5 brackets? If he could make 1 every night after school and 4 on Saturday, how many could he make in a week? For how much could he sell them? How much money would he have left after buying a two-dollar hat?

13. What is $\frac{1}{2}$ of 30?

14. What is $\frac{1}{3}$ of 30?

15. What is $\frac{2}{3}$ of 30? *Answer.* $\frac{2}{3}$ of 30 is 20. *Solution.* If $\frac{1}{3}$ (one-third) of 30 is 10, $\frac{2}{3}$ (two-thirds) is twice 10, which is 20; hence, 20 is $\frac{2}{3}$ of 30.

16. What is $\frac{1}{4}$ of 20?

17. What is $\frac{3}{4}$ of 20? *Solution.* If $\frac{1}{4}$ (one-fourth) of 20 is 5, $\frac{3}{4}$ (three-fourths) of 20 is 3 times 5, which is 15; hence, 15 is $\frac{3}{4}$ of 20.

18. What is $\frac{4}{7}$ of 21?

19. What is $\frac{2}{9}$ of 18?

LESSON XXXV.

1. 12 units make a dozen, and 12 dozen make a gross. Our steel pens are put up in gross boxes. How many pens in a box?

2. What is the cost per box, if the pens are a cent apiece?

3. Where are the hands of the clock at half-past four?

4. Write the numbers from 40 to 50 in Arabic characters, or figures.

5. Write the numbers from 55 to 60 in Roman characters.

6. Where is Arabia?

7. Where is Rome?

8. Write in words 54675, 896004, 3640, 36811.

9. Write in figures twenty-five thousand two hundred and seven.

10. How many years since the great Boston fire in 1872?

11. How many years since the great Chicago fire in 1871?

12. How many years since the great London fire in 1665?

13. Napoleon Bonaparte was born in the year 1769, and died in the year 1821; how old was he at the time of his death? Where was he born? Where did he die? Where is he buried?

14. Write or repeat the division table of 9's in four forms.

15. What is ½ of 38? of 36? $\frac{1}{\text{half}}$ of 28? of 32? of 26?

16. What is $\frac{1}{\text{third}}$ of 30? of 60? ⅓ of 90? of 99? of 12? of 15?

17. Write the even numbers from 2 to 30.

18. Write the odd numbers from 1 to 39.

19. Divide 1347689 by 2; by 3; by 4; by 5; by 6; by 7.

20. Divide, by Long Division, 36489742 by 12.

21. Divide the above example by Short Division.

22. Multiply the numbers from 99 to 105 by 2.

23. Write the multiplication table as far as "6 times 6" in a square.

LESSON XXXVI.

1. How is a number multiplied by ½? *Answer.* A number is multiplied by ½ by dividing the number by 2.

2. 16 multiplied by ½ equals 8.

3. 20 × ½ = how many?

4. 17 × ½ = how many? *Answer.* 17 × ½ = 8½.

5. 12 × ½ = how many?

24 × ½ = ?
16 × ½ = ?
13146 × ½ = ?
144 × ½ = ?
80 × ½ = ?
90 × ½ = ?
46 × ½ = ?

30 × ½ = ?
64 × ½ = ?
500 × ½ = ?
25 × ½ = ?
22 × ½ = ?
44 × ½ = ?
66 × ½ = ?

10 × ½ = ?
50 × ½ = ?
5 × ½ = ?
37 × ½ = ?
45 × ½ = ?
55 × ½ = ?
65 × ½ = ?

6. Multiply 112 by 12½; thus:

$$\begin{array}{r} 2)112 \\ \underline{12\tfrac{1}{2}} \\ 1344 \\ \underline{56} \\ 1400 \end{array}$$

7. Multiply 38 by 37½. 240 by 6½. 3648 by 35½. 4602 by 12½.

8. Arthur and Theo broke two panes of glass while playing in the stable with Mr. Proctor's colt. What must each boy pay to replace the glass at 87½ cents a pane?

9. How many years since the landing of the Pilgrims at Plymouth, Mass.? You will find the year of their landing in your United States History.

10. For what is "Mass." an abbreviation?

11. Which is the shortest month in the year?

12. How many days in March? in October? in April?

13. Write or repeat the names of the months which have 31 days.

14. What time is it when the hour-hand of the clock is between 4 and 5, and the minute-hand is at 9?

15. Multiply 7346 by 92. 86471 by 185.

16. Divide 1736479 by 64. 87541 by 362.

17. Double 17, 14, 19, 18, 16, 25, 50, 150, 15, 22, 33, 21.

18. What is ½ of 9? of 12? of 50? of 60? of 20? of 75? of 85?

LESSON XXXVII.

1. How do you find a quarter of anything? Do you remember that a quarter and ¼ are the same?

2. How do you find one-fourth of a number?

3. Cyrus trapped 25 minks and 50 muskrats one winter. He sold the mink-skins to a furrier for $, and the muskrat-skins for ¼ as much as he got for the mink-skins. How much did he get for all? How much were the mink-skins apiece? How much were the muskrat-skins apiece?

4. Rosanna picked a two-quart pailful of blackberries in one hour, and Lydia picked a one-quart pailful in the same time; how many pints of berries did they both pick? How many more pints did Rosanna pick than Lydia? At another time, when each carried the same pail as before, Rosanna had her pail only half full; how many berries did she get this time? How many did Lydia get the second time? How many gills did they both get?

5. What part of a quart is one pint?

6. By what measure is fruit measured?

7. Write and recite the table of Dry Measure.

8. Stephen had four broods of turkeys, numbering in all 44 young turkeys. One little one died, three were carried off by the hawks, one the dogs killed, and several were lost, so that by Thanksgiving time one-fourth of them were gone; how many remained? For how much could Stephen sell those remaining at $1.12½ apiece?

9. If milk is 6 cents a quart, how much will 39 cents buy?

10. Do you write the answer 6 quarts and a half or 6 quarts and 1 pint?

11. What will one pint of milk cost at 6 cts. a quart?

12. How many gills in a pint?

13. Guy had a pint of milk for his supper, and gave a quarter of it to his kitten. How much did kitty get? How many gills did Guy have for himself?

* * *

LESSON XXXVIII.

1. Find one-quarter of one thousand.

2. What is $\frac{1}{4}$ of 4000? $\frac{1}{2}$ of a hundred? $\frac{1}{3}$ of 36? $\frac{1}{5}$ of 45? $\frac{1}{3}$ of 75? $\frac{1}{2}$ of 500? $\frac{1}{4}$ of 500? $\frac{1}{15}$ of 75? $\frac{1}{10}$ of 100? $\frac{1}{2}$ of 90? $\frac{1}{5}$ of 100?

3. How many days in July, August, September, and October?

4. How many week-days in 6 weeks? in 12 weeks?

5. How many week-days in a year?

6. How many Sundays in a year?

7. Write in figures X, XVII, VIII, CCLV, M, XII, XIX, XLIX, LXIV, CXLVI.

8. Multiply a number containing four figures by a number containing three figures.

9. Divide a number containing seven places by a number containing four places.

10. Double the numbers from 11 to 25.

11. Roger made 16 croquet balls which weighed half a pound apiece; how much did they all weigh? The balls weighed one-half as much as the mallets; how much did each mallet weigh? How much did the 16 balls and 16 mallets weigh?

12. Write the table of Avoirdupois Weight.

13. How many ounces in half a pound?

14. How many ounces in one pound and a half?

15. How many ounces in a quarter of a pound?

16. If there are 4 ounces in ¼ of a pound, how many ounces are there in ¾ of a pound?

17. Norman caught three trout, weighing respectively 6, 8, and 10 ounces; how many pounds did they all weigh?

18. Write or repeat the multiplication table of 8's backward.

19. Write or repeat the division table of 5's backward.

20. How many wings has a flock of 75 birds?

21. How many wings has a brace of partridges? A "brace" of birds is a pair.

LESSON XXXIX.

1. What part of a dollar is 50 cents? is 25 cents? is 20 cents? is 10 cents? is 5 cents?

2. Write the even numbers from 20 to 40.

3. Write the odd numbers from 40 to 60.

4. Write 1263 in Roman characters.

5. How many slates at 15 cts. apiece can be bought for $1.50?

6. What time is it when the hour-hand of the clock is at 4 and the minute-hand is at 12?

7. Draw the face of a clock with the hands as they are at five o'clock.

8. What will 2 pineapples cost when 4 pineapples cost a dollar?

9. If there are 75 clusters of grapes on a vine, and they are sold at 5 cents a cluster, how much will they bring? If 5 bunches fill a box, how many boxes can be filled from the vine? What will one box be worth? What will a dozen boxes be worth?

10. What year is this?

11. In what year were you born?

12. How many hours from nine o'clock in the morning until four in the afternoon?

13. How many hours from nine o'clock Monday morning until nine o'clock Tuesday morning?

14. How many hours from 9 o'clock in the morning until 9 o'clock in the evening?

15. Add 3648, 9821, 78, 463, 32189, 568, 367, and 46842.

16. Write with figures and signs the following: One hundred multiplied by one-half equals fifty. Sixteen multiplied by two and one-half equals forty. Twice seventy-five are one hundred and fifty.

17. What time is it when the hour-hand of the clock is at 6 and the minute-hand is at 12?

18. What time is it when the minute-hand is at 9 and the hour-hand is between 3 and 4?

19. What time is it when both hands are at 12?

20. What time is it when the minute-hand is at 8 and the hour-hand is between 7 and 8?

21. What time is it when the hour-hand is between 6 and 7 and the minute-hand is at 6?

LESSON XL.

1. What is latitude? Write for answer the definition given in your Geography.

2. Are we in north or south latitude?

3. How many degrees of latitude are there?

4. Draw a circle. Draw a half-circle. Draw a quarter-circle.

5. How many degrees are there in a circle? You will find the number of degrees in a circle in the table of Circular Measure.

6. How many degrees in half a circle, or in a "semi-circle"?

7. Name some common things which are circles.

8. What is the circle called which passes around the earth at equal distances from the poles, and from which latitude is reckoned?

9. There are 90 degrees in a quarter of a circle.

10. The Equator is everywhere just 90 degrees from the poles. What part of a circle is the distance from the Equator to either pole?

11. What is the sign used to express degrees?

12. Express 10 degrees by means of the sign. 40 degrees. 180 degrees.

13. Has a small circle, like a tiny finger-ring, as ny degrees as a large circle, like a carriage-wheel, the great circle of the earth, called the Equator?

14. Take the school-room globe and tell what part of a circle the distance from the Equator to either pole is.

15. Is the distance everywhere the same?

16. How far, then, in degrees, is the North Pole from the Equator?

17. How far is the South Pole from the Equator?

18. Do we live north or south of the Equator?

19. Do we live in north latitude or in south latitude?

20. Latitude is marked on the sides of all maps.

21. In what latitude is Boston? is New York? is Washington? is New Orleans? is Chicago? is Quebec? is Portland, Maine?

22. The latitude of Boston is 42° north, and that of St. Augustine, Fla., is 29° north; how many degrees farther north is Boston than St. Augustine?

23. If Portland is in the 43° north latitude, and Boston is in the 42° north latitude, how many degrees farther south is Boston than Portland?

24. The latitude of Rio Janeiro, Brazil, is 23° south; how many degrees is Rio Janeiro south of Boston?

25. Recite or write the table of Circular Measure.

LESSON XLI.

1. Recite or write the table of Dry Measure.

2. Is this the measure used in measuring berries?

3. Mr. Robinson keeps 25 horses in his livery stable, and they are each fed 4 quarts of oats morning and night; how much is given each horse daily? How many bushels are given the 25 horses daily?

4. If a horse eats 4 quarts of grain daily, how long will a bushel last him?

5. When oats are 80 cents a bushel, what is the cost of a peck?

6. How much must be paid for ½ peck?

7. How many quarts in ½ peck?

8. What are 25 bushels of oats worth at the above rate?

9. Have you sand, barley, or anything in your school-room which you can measure by Dry Measure? If so, take up as much as you think will just fill the quart measure, and see if you have the exact amount.

10. Did you get *just* a quart?

11. 100 ÷ 2 = ?
100 ÷ 4 = ?
100 ÷ 5 = ?
100 ÷ 10 = ?
100 ÷ 20 = ?
100 ÷ 25 = ?
100 ÷ 50 = ?
96 ÷ 2 = ?
96 ÷ 3 = ?
96 ÷ 4 = ?
96 ÷ 6 = ?

96 ÷ 8 = ?
96 ÷ 12 = ?
96 ÷ ~~16~~ = ?
96 ÷ ~~24~~ = ?
96 ÷ ~~32~~ = ?
96 ÷ ~~48~~ = ?
64 ÷ 2 = ?
64 ÷ 4 = ?
64 ÷ 8 = ?
64 ÷ 12 = ?
64 ÷ ~~16~~ = ?

64 ÷ ~~32~~ = ?
72 ÷ 2 = ?
72 ÷ 3 = ?
72 ÷ 4 = ?
72 ÷ 6 = ?
72 ÷ 8 = ?
72 ÷ 9 = ?
72 ÷ 12 = ?
72 ÷ ~~18~~ = ?
72 ÷ ~~24~~ = ?
72 ~~÷ 36 = ?~~

12. The sum of any three consecutive numbers equals the product of three times the middle number. The sum of 3, 4, and 5 is 12. 3 times 4 are 12. How many are 4, 5, and 6? 9, 10, and 11?

LESSON XLII.

1. Write the ordinal numbers from 10th to 24th inclusive.

2. Point off the following into periods, naming the periods:

Units.
13568978426,713,586

3. What is the name of the point used?

4. Write the above number again, writing the figures of each period followed by the name of that period; thus, 13 quadrillion, 568 trillion, etc.

5. How is the sign of division read?

6. How is the sign of multiplication read?

7. How is the sign of subtraction read? the sign of addition?

8. Write out the following in words:

$75 - 25 = 50.$ $200 \div 20 = 10.$ $20 \times 20 = 400.$
$16 \times 4 = 64.$ $96 \div 4 = 24.$ $45 + 45 = 90.$
$18 + 18 = 36.$ $125 - 50 = 75.$ $25 \times 25 = 625.$

9. Write the multiplication table as far as "12 times 12" in a square.

10. Mrs. North's velvet dress cost $120.00. The velvet was $5.00 a yard, the trimmings $15.00, and the making $20.00. How many yards of velvet did she buy? What would another half-yard of velvet cost from the same piece?

11. What time is it when the hour-hand and the minute-hand of the clock stand at 12?

12. Does the hour-hand move once around the face of the clock every hour? Does the minute-hand?

13. How many times will the hour-hand go around the dial from noon to-day till noon to-morrow?

14. How many times will the minute-hand go around from noon to-day till noon to-morrow?

◆

LESSON XLIII.

1. How many halves make the whole of anything?

2. If Nellie gives ½ of her orange to Ethel, how much will Nellie have left?

3. If a pie is cut into 6 equal pieces, what part of the pie is one of those pieces? If Carrie, Grace, and Inez eat each a piece, what part of the pie remains?

4. How many halves in a whole thing or unit?

5. How many thirds in a unit? Illustrate. How many fourths? fifths? sixths? tenths?

6. If Mrs. Shaw gave Joseph ½ of a turnover, and Freddie another half, how much was left?

7. How many degrees south of Quebec is Washington?

8. In what latitude is Philadelphia?

9. In what latitude is the North Pole?

10. How many miles, or about how many miles, is it around the earth? You will find the distance given in your Geography.

11. What is the distance around the earth called?

12. What is the circumference of the earth?

13. What is the circumference of the earth in miles?

14. Draw a circle on your slate.

15. How many degrees in the circle you have drawn?

16. Is there the same number of degrees in all circles, small and great?

17. If there are 360° in the circumference of the earth, and the circumference of the earth is about 25000 miles, how many miles are there in a degree? *Answer.* There are nearly 69½ miles in a degree, as you will see by dividing 25000 by 360.

◆

LESSON XLIV.

1. Write a number containing ten figures.

2. Write the same number in words.

3. Write the same number again, writing each period in figures and the name of the period in words.

4. Write six even numbers; eight odd numbers; four ordinal numbers.

5. Add an even number containing two figures to an odd number containing three figures.

6. Subtract an even number from an odd number.

7. Subtract a number containing two figures from another number containing two figures, using the signs of subtraction and equality.

8. If a locomotive runs 25 miles an hour, how far will it run in 6 days of 14 hours each?

9. Do the hands of a clock stand in the same position at 12 o'clock noon as at 12 o'clock midnight?

10. A gentleman paid $100.00 for a horse, $60.00 for a carriage, $21.00 for a harness, $6.00 for a heavy carriage robe, $2.00 for a linen robe, and $3.00 for a whip; how much did the whole cost?

11. Mr. Baker has 240 apple trees for his new orchard which he is going to lay out in 12 rows; how many trees will there be in a row? If the trees are everywhere equally distant, will the orchard be a square?

12. How many days in a fortnight?

13. How many days from the 25th of July to the 25th of August?

14. Mr. Morse planted two pieces of sweet corn, each containing ½ an acre; how much land in both pieces?

15. By what is land measured?

16. Write or recite the table of Square Measure; of Long Measure.

17. How many feet in 40 rods?

Solution. 2) 40 times
16½ feet
640
20
There are 660 feet in 40 rods.

18. The sum of 19, 20, and 21 is three times what number?

19. Three times 7 is the sum of what three consecutive numbers?

LESSON XLV.

1. How many score in 100?

2. How many dozen in 100?

3. How many pair in 50?

4. How many brace in 10?

5. If it is 200 miles from Boston to New York by rail, and 96 miles from New York to Philadelphia, what is the distance from Boston to Philadelphia?

If Portland is 106 miles from Boston, how far is Portland from Philadelphia? How far is Portland from New York?

6. In what latitude is Mt. Washington?

7. Mt. Washington is how many degrees farther south than Mt. Fairweather, Alaska?

8. How many miles is Salt Lake City from the Equator?

9. Is the Equator north or south of the City of Mexico?

10. If a cow gives 12 quarts of milk in the morning and 9 quarts at night, how many gallons does she give in a week?

11. What will be the cost of an overcoat which requires 5½ yards of material at $4.00 a yard, and the trimmings and making of which will cost $10.00?

12. Dwight bought three dozen pears, which he distributed equally among his playmates, Albert, Mark, Abner, David, and James, keeping as many for himself as he gave each of his friends. How many pears had each boy?

13. A gentleman 30 years of age married a lady 5 years younger than himself. How old will the gentleman be when his wife is 30? How old will the lady be when her husband is 40? How old was the lady at the time of her marriage?

LESSON XLVI.

1. Add together all the odd numbers from 95 to 100, inclusive.

2. Double the numbers from ten to thirty.

3. Write in figures and in words CLXXXVII.

4. Write two thousand in Arabic characters.

5. Write two thousand in Roman characters.

6. Supply the following:

12 × = 144.
11 × = 121.
10 × = 100.
9 × = 81.
8 × = 64.
7 × = 56.
9 × = 63.
8 × = 56.
7 × = 42.
6 × = 54.
12 × = 120.
11 × = 110.
12 × = 132.
11 × = 121.
12 × = 144.

7. Write the table of United States Money.

8. Write or recite the table of Square Measure; of Long Measure; of Dry Measure; of Liquid Measure; of Time Measure; of Circular Measure.

9. Divide by short division, 137946857136 by 12.

10. Multiply a number consisting of four 9's by 34, and prove the work by division.

11. Write a number consisting of four 7's.

12. Write the same number in words.

13. Sammie went to the garden one day late in the summer, to get the vegetables for dinner. He dug two hills of potatoes, from one of which he took 10 and from the other 12 potatoes. He picked 2 small squashes, 8 tomatoes, and 3 cucumbers. He pulled 3 beets, and then went into the orchard, where he found 12 delicious apples, and on his way back he picked 6 bunches of grapes. How many vegetables and what fruit did Sammie's mother have for dinner?

LESSON XLVII.

1. In the number 36478 what is the name of the first place on the right? How many units are there? What is the name of the second place? How many tens are there? How many hundreds? How many thousands? How many ten thousands?

2. After dinner one day Nora wiped and placed on the sideboard a dozen dinner plates, 9 soup plates, 10 pie plates, 8 dessert plates, 12 butter plates, 10 cups and saucers, a soup tureen and ladle, 4 platters, 3 vegetable dishes, 1 bowl, 1 sauce dish, 2 fruit dishes, 1 pudding dish, a gravy boat, 2 pitchers, and a teapot. She afterward put them all in the china closet, except the pitchers and teapot. How many dishes did she put away?

3. How many hours from midnight till noon?

4. How many minutes from a quarter past 9 till 10 o'clock?

5. How many feet around the outside of a room which is 15 feet long and 12 feet wide?

6. How many square feet in the floor of the above room?

7. How many yards of "yard-wide" carpeting would be required to cover the floor; and what would it cost at \$2.37½ per yard?

8. Draw a square, representing the number of square feet in a square yard?

9. How many square feet in a square yard? How many square yards in the above floor?

10. 180 ÷ 12 = how many?

11. Curtis had 50 large, handsome sunflowers, which he was raising for the seeds, with which to feed his poultry, but a hailstorm destroyed half of them; how many were left?

12. How many pages in 2 dozen copies of your "History of the United States"?

13. Subtract 36481 from 100000; 8964 from 367123.

LESSON XLVIII.

1. By what is a number multiplied when a cipher is added to its right?

2. By what is 17 multiplied to get 170?

3. By what is a number multiplied when two ciphers are added to its right?

4. What does 17 become when two ciphers are annexed, or added, to its right?

5. By what is 17 multiplied to produce 1700?

6. What does 17 become when three ciphers are added to its right?

7. By what is a number multiplied when three ciphers are added to its right?

8. By what is 17 multiplied to produce 17000?

9. Multiply:

35 by 10.
50 by 10.
47 by 100.
64 by 100.
12 by 100.
364 by 10.
38 by 100.
62 by 1000.
112 by 1000.

10. If your geography costs a dollar and a quarter, your small history fifty cents, your note-book fifteen cents, your slate eighteen cents, your pencils ten cents, your writing-paper one dollar, your arithmetic ninety cents, and your drawing-book half a dollar, can you buy them all for a five-dollar bill?

11. If it takes one ball of candle-wicking to knit a slate-cloth, and the wicking costs 48 cents a dozen balls, what is the cost of one slate-cloth? What is the cost of half a dozen slate-cloths?

12. What is the cost of 1 pen when a box of 125 pens costs a dollar and a quarter?

13. A lady bought a sewing-machine for $75.00, and after using it a year sold it for $20.00 less than she gave for it. She then bought a new machine for $55.00. Did she sell the old machine for enough to pay for the new one?

14. If there are 25 grapes in every cluster, how many grapes would there be in a dozen boxes containing 3 clusters each?

15. Write or repeat the division table of 12's in four forms.

16. Add 76348, 29876, 2347, 36432, and 89468.

17. What number added to itself equals 38?

18. What number multiplied by 100 equals 3600?

LESSON XLIX.

1. How many years are there in a century? *Answer.* There are 100 years in a century.

2. What year is this?

3. From what time, or from what event, do we reckon years?

4. How many years since the birth of Christ?

5. Was three thousand years ago before or since the birth of Christ?

6. How do we reckon time before the birth of Christ?

7. Write the abbreviation for "Before Christ."

8. What is the meaning of B.C. 450?

9. What is the meaning of A.D. 1884?

10. What is the meaning of "Anno Domini"?

11. What is the meaning of "B.C. 65"?

12. In what year was Julius Cæsar born? Alexander the Great? Napoleon Bonaparte? Mary, Queen of Scots? Hannibal?

13. In what year were you born? In what century?

14. What is the present century?

15. The first century was from A.D. 1 to the year 100, and is written "the 1st century." The 2d century was from the year 100 to the year 200. The 3d century was from the year 200 to the year 300.

When was the 4th century? the 5th century? the 6th century? the 18th century?

16. In what century was the year 1350? the year 1825? the year 1000? the year 830? the year 1630?

17. In what century was B.C. 250? the year 250? B.C. 450? A.D. 450?

18. How many years since B.C. 500?

19. How many centuries since B.C. 500?

20. How many centuries since B.C. 200? since A.D. 1066?

LESSON L.

1. Draw a circle. Draw a straight line through the centre of the circle to its circumference on opposite sides. Write the word "circumference" on the line which bounds the circle. Write the word "diameter" on the straight line which passes through the centre of the circle. Draw another diameter in a different direction through the circle. Draw a number of diameters. Are they all of the same length?

2. Go to the schoolroom slate or blackboard and draw a large circle. Draw a diameter to this circle. As exactly as possible measure both the diameter and the circumference with a string, and tell how many times greater the circumference is than the diameter.

3. Is the circumference *just* three times as great as the diameter, or is it *about* three times as great?

4. Which can you more easily measure, a straight line or a curved line?

5. How could you find the circumference of the clock dial?

6. Would you measure the circumference of the dial, or measure the diameter and multiply the diameter by 3?

7. If the diameter of a circle is 8 inches, what is the circumference?

8. If the circumference of a circle is 9 feet, what is the diameter?

9. How do you find the circumference of a circle when the diameter is given?

10. How do you find the diameter of a circle when the circumference is given?

LESSON LI.

1. Get your school-room globe and measure its circumference. If you have no tape measure, use a string, and measure the string by your rule.

2. The distance through the globe is its diameter.

3. Can you measure the diameter of the globe?

4. How many inches does the circumference measure?

5. What part of its circumference is its diameter?

6. What would be the diameter of a globe which was three feet in circumference?

7. From your Geography learn the circumference of the earth.

8. What is the diameter of the earth?

9. Is 8000 miles *just* ⅓ of 25000 miles, or about ⅓?

10. Is it a little more or a little less than $\frac{1}{3}$?

11. Is the diameter of a circle a little more, or a little less, than $\frac{1}{3}$ of its circumference?

12. What is the circumference of a circle which is 2 feet in diameter?

13. What is the diameter of a circle which is 13 feet in circumference?

14. What is meant by the circumference of a globe? of a circle?

15. What is the distance through the centre of a globe called? What is the distance around a circle called? What is a line called passing through the centre of a circle and terminating in opposite sides of its circumference? What is the line called which bounds a circle? What is a line called which divides a circle into halves?

LESSON LII.

1. Fill out the following and give the answers. What number is — more than — ? *e.g.*, What number is 5 more than 10?

2. What number is — less than — ?

3. What part of — is — ?

4. How many times will — go in — ?

5. — divided by — equals how many?

6. Add — and — and —.

7. Subtract — from —.

8. What number multiplied by — produces —?

9. What number is — times —?

10. How many more is — than —?

11. How many less is — times — than —?
12. What number added to itself equals —?
13. — in — how many times?
14. — minus — is how many?
15. — is what part of —?
16. How many are — divided by —?
17. — from — leaves how many?
18. What is the sum of — plus —?
19. Multiply — by —.
20. Add — to itself.
21. What number subtracted from itself leaves —?
22. What is the amount of — and — and — and —?
23. How many —'s in —?
24. — is how many times —?

LESSON LIII.

1. Give and perform three problems in which the sum of $3 + 2 + 2$ is to be subtracted from 12; *e.g.*, Susan had 12 tulips. She gave 3 of them to Julia, 2 to Ellen, and 2 to May; how many tulips had she left?

2. Give and perform three problems requiring the following process: $25 - (3 + 1 + 6 + 12) = 3$.

3. State and perform three problems in which 10 times 2 is to be subtracted from 25; *e.g.*, If Granville pays 2 cents apiece for 10 lead-pencils, how much change will he have left from 25 cents?

4. Give and perform three problems in which 108 divided by 12 equals 9; *e.g.*, How many classes

in a school of 108 pupils, if each class consists of 12 members?

5. State and perform three problems requiring the following process, (9 × 9) – (9 × 8); *e.g.*, How many more trees in an orchard consisting of 9 rows of trees with 9 trees in a row than in an orchard consisting of 9 rows with only 8 trees in a row?

6. State and perform two problems requiring the following: (21 – 10) + (6 + 4) – 21.

7. State and perform one in which 24 is divided by 4.

8. Give and perform one in which the sum of 9, 10, 15, and 18 is to be divided by 2.

9. Give and perform a problem in which one dollar is divided into ten equal parts; in which 56 is divided by 7; in which 84 is divided by 7 and the result multiplied by 6.

10. Give and perform three problems requiring the following process: (12 × 2) – (3 + 1).

11. Give and perform a problem in which 31, 30, 31, and 31 are added.

12. Give and work out three problems in which there shall be the following: 3 × 4 + 1.

13. State and solve a problem in which the following process is required: 37 – (6 × 6).

LESSON LIV.

1. Perform two examples in Short Division.

2. How is a number multiplied by 10? by 100? by 1000?

3. Multiply 17 by 200; thus: $17 \times 200 = 3400$. In this process 17 is multiplied by 2, and the two ciphers annexed to the result.

4. Multiply:

18 by 20.
16 by 2000.
14 by 200.
13 by 2000.
19 by 20.
15 by 2000.
15 by 1000.
14 by 10.
18 by 20.

5. Write the odd numbers from 10 to 20 in Roman letters.

6. What letters are used to represent numbers?

7. Learn from your Common School Arithmetic how to represent thousands by Roman letters.

8. Write 4 thousand with Roman characters; 8 thousand; 10 thousand.

9. How many Arabic characters are used to represent numbers?

10. Why are figures called Arabic characters?

11. Which characters are the more commonly used, the Roman or the Arabic? Can you tell why?

12. Mention some of the purposes for which Roman letters are generally used to express numbers.

13. Write Henry the Eighth as you find it in your History, chapter tenth, section third, lesson fourth.

14. How many years since Christopher Columbus discovered America? In what century was that event?

15. In what latitude is Palos, the Spanish port from which Columbus sailed?

16. Did he land north or south of Palos?

17. In what latitude is San Salvador?

18. San Salvador is how many degrees farther north than the mouth of the Orinoco River in South America, where Columbus landed on one of his later voyages?

LESSON LV.

1. What number is $\frac{1}{2}$ of 100?

2. What is $\frac{1}{3}$ of 75? $\frac{1}{4}$ of 20? $\frac{1}{10}$ of 100? $\frac{1}{8}$ of 72?

3. A farmer shot $\frac{1}{10}$ of a flock of 50 crows which were robbing his corn-field. How many crows did he shoot?

4. Clayton saw, at the blacksmith's shop, a yoke of white oxen, a yoke of red oxen, and a yoke of black and white oxen. The blacksmith who shod the oxen told Clayton that each foot required two shoes; how many shoes were necessary for all the oxen?

5. If there are a hundred soldiers in a company, and ten companies in a regiment, how many soldiers are there in a brigade of ten regiments?

6. Did you ever see a regiment of one thousand soldiers?

7. What will a ream of paper cost at half a cent a sheet? If you do not know the number of sheets of paper in a ream, you can find it either in the Appendix or in the Dictionary under the word "ream."

8. If you use 6 sheets of paper a day, how long will half a ream last?

9. Mr. Perkins, the grocer, purchased 16 boxes of toilet soap, each box containing a gross of cakes. He paid $14.40 a box; how much did he pay for the lot? He sold the soap at the rate of 11 cents a cake. How much did he get for 1 box? How much did he get for all the soap? How much did he pay a cake? How much did he make on one cake? How much did he make on the lot?

10. Leonard borrowed $1.25 of his mother, with which to buy a new collar for his dog Carlo. On Saturday night, when his father gave Leonard his spending money, he paid his mother 25 cents; the next week he paid 20 cents; and ½ of the remainder he paid the week following; how much was still unpaid? How much was the third payment? the first payment? the second payment?

LESSON LVI.

1. Write five cents, using figures and the sign for United States Money.

2. Subtract seven dollars and twenty cents from twenty dollars.

3. If a farmer sells 5 dozen hens' eggs at 25 cents a dozen, 5 dozen turkeys' eggs at 30 cents a dozen, and 5 dozen geese' eggs at 50 cents a dozen, how much more will he get for the turkeys' eggs than for the hens' eggs? How much more for the geese' eggs than for the hens' eggs?

4. Subtract $384.25 from $1000.

5. Write in figures one billion one hundred thousand three hundred and fifty.

6. What mark is used in pointing off figures into periods?

7. What point is used in separating cents from dollars?

8. Is United States money used in England?

9. Write the table of English Money.

10. On Allen's 20th birthday his father presented him with a watch which cost $60.00, a chain costing half as much as the watch, a seal costing $10.00, and a charm worth $5.00. How much did Allen's birthday present cost his father?

11. A man bought a farm for $2000, agreeing to pay $200 down, and $200 every year till it was paid for. How many years had he in which to pay for his farm? If he was 22 years old when he bought the farm, how old was he when he made the last payment?

12. How many years since the battle of Waterloo?

13. How many years since the battle of Bunker Hill? You will find the date of the battle of Bunker Hill in your History of the United States, and the date of the battle of Waterloo in any complete English, French, or German history, or in the "Life of Napoleon."

LESSON LVII.

1. Write the ordinal numbers in words from eighteenth to twenty-fifth.

2. Write the cardinal numbers in words from eighteen to twenty-five.

3. Write or recite the odd numbers from 18 to 25.

4. Give the even numbers from 18 to 25.

5. Add 7 to each of the following: 14; 4; 24; 34; 44; 54; 64; 74; 84; 94; 104.

6. Add 8 to each of the above numbers; 5; 9; 10.

7. Supply the following:

36 ÷ = 2.
36 ÷ = 3.
36 ÷ = 4.
36 ÷ = 6.
36 ÷ = 9.
36 ÷ = 12.
36 ÷ = 18.

39 ÷ = 13.
39 ÷ = 3.

2 in 72, times.
3 in 72, times.
4 in 72, times.
6 in 72, times.
8 in 72, times.
9 in 72, times.
12 in 72, times.
18 in 72, times.
24 in 72, times.
36 in 72, times.

— in 96, twice.
— in 96, 3 times.
— in 96, 4 times.
— in 96, 6 times.
— in 96, 8 times.
— in 96, 12 times.
— in 96, 16 times.
— in 96, 24 times.
— in 96, 32 times.
— in 96, 48 times.

8. If Malcolm (Mălkum) can earn $1.75 a day, how much could he earn in a vacation of 7 weeks, taking only 3 holidays?

9. Rosa bought a collar for $0.75, a silk handkerchief for $0.75, 2 pairs of mits at $0.62½ a pair, a lace scarf for $1.25, an umbrella for $3.50, and $0.20 worth of 2-cent skeins of sewing silk, for all of which she paid a 20-dollar bill. The clerk handed her $13.00 in change, which she gave back to him, saying that he had given her too much. Did the clerk make a mistake?

10. Did the clerk give Rosa too much or too little change? How much should he have given her? How much more or less than the right change did he give her?

LESSON LVIII.

1. What numbers will divide 20 without a remainder? If 2, 4, 5, and 10 divide 20 without a remainder, they are the divisors of 20.

2. What are the divisors of 16? *Answer.* 2, 4, and 8 are the divisors of 16.

3. What are the divisors of 12? of 15? of 18? of 24?

4. Divide 30 by its divisors, thus:

$30 \div 2 = 15.$ $30 \div 3 = 10.$ $30 \div 5 = 6.$
$30 \div 6 = 5.$ $30 \div 10 = 3.$ $30 \div 15 = 2.$

5. Divide 36 by all its divisors.

6. What are the divisors of 40? of 42? of 45? of 50?

7. What number added to itself equals 38? 36? 30? 28? 34? 24? 48? 90? 86? 78?

8. 18 is double what number? 42? 66? 32? 46?

9. What remainder do you get in dividing 19 by 5?

10. How many times will 5 go in 19? *Answer.* 5 will go in 19, 3 and $\frac{4}{5}$ times, or $3\frac{4}{5}$ times.

11. How many times will 6 go in 19? *Answer.* 6 will go in 19, $3\frac{1}{6}$ times.

12. A gentleman pays $15.00 a week for board for each of the adult members of his family and half price for the children. His family consists of himself and wife, a young lady niece, a grown-up son, one little girl, and three little boys. How much does the gentleman pay a week for board?

13. There are 3 windows in each of 3 school-rooms, 2 windows in the amusement room, 3 in the reading room, 3 in the corridor, and one over the cloak-room door; there are 2 sash doors, in one of which there are 12 panes of glass, and in the other, 20; and a transom over one door, containing 4 panes. All the windows proper have each 12 panes of glass. How many panes in all?

14. If Lena gives ½ of her orange to Freddie, how much has she left?

15. How many halves make a whole orange?

16. How many quarters make a whole orange?

17. Which is larger, one-half or one-quarter of an orange?

LESSON LIX.

1. Divide 36 by all its divisors.

2. Write the multiplication table as far as "11 times 11" in a square.

3. Write 22, 23, 24, 25, 26, 27, 28, and 29 in a column and subtract from each the following numbers in turn: 7, 2, 8, 6, 5, 3, 9, 4, 10, 11, and 12, using the signs of subtraction and equality.

4. A farmer brought into town a load of wood containing 1½ cords with which to pay for groceries. He sold the wood at $8.00 a cord. He bought a chest of tea weighing 10 pounds at $0.50 a pound;

a box of raisins weighing 8 pounds at $0.12 a pound; 50 pounds of sugar at $0.08 a pound; and a can of kerosene oil for $1.00. Did the farmer sell his wood for enough to pay for his groceries? How much did he have left from the sale of his wood?

5. By what is wood measured?

6. Write or recite the table of Cubic Measure.

7. What are the dimensions of a cord of wood? How long is the wood cut? How high is it piled? How long is the pile?

8. Does a cord of wood make a perfect cube?

9. Does one-half cord? *Answer.* One-half cord does make a perfect cube.

10. How high is ½ cord of wood? How long? How wide?

11. How many times must cord-wood be sawed to make sticks a foot long?

12. Draw a stick of wood, or draw a line and imagine it a stick of 4-foot wood, and show how many times it must be sawed to make 4 sticks.

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LESSON LX.

1. Look at the school-room thermometer and tell where the mercury stands in the glass tube.

2. Is it above or below the figures 70, which we call 70°?

3. Which indicates the higher temperature, 60° or 70°?

4. Does "higher temperature" mean warmer or colder?

5. From what point is the temperature reckoned on the glass?

6. When the mercury stands at zero, does it indicate heat or cold?

7. How is zero marked?

8. What is mercury?

9. Which indicates the greatest cold, zero, above zero, or below zero?

10. Did you ever see the mercury below zero?

11. Did you ever see it above 90°?

12. What force expands the mercury?

13. What makes it contract?

14. How many degrees colder is it when the mercury stands at zero than when it stands at 65° above zero?

15. How much colder is it at 20° below zero than at 20° above zero?

16. Make a picture of a thermometer, marking the scale with the proper numbers.

17. How much colder is it a winter morning with the mercury 12° below zero than it is a summer afternoon with the mercury at 94° above?

18. How much warmer is it at mid-day with the thermometer at 30° above than before sunrise with the thermometer at 4 below?

19. How much warmer is it at 30° above zero than it is at 4° above?

20. One morning last winter the mercury went down to 27° below zero in Canada, and one day in August it went up to 110° in New Orleans; how much warmer was the summer day in New Orleans than the winter day in Canada?

21. Where does the mercury stand when it is just cold enough to freeze water?

You will see "freezing point" written on the thermometer.

22. How hot must water be before it will boil?

23. How many degrees from freezing point to boiling point?

24. Will water freeze in a room where the mercury stands at 34°?

25. Will water freeze in a room where the mercury runs down to 31°?

LESSON LXI.

1. Write the odd numbers from 15 to 25 inclusive in a column, and multiply each by 2.

2. Write the even numbers from 15 to 25 in a column, and double them.

3. Add together six numbers of four figures each.

4. Subtract a number of 6 places from one of 7 places.

5. By what is 47 multiplied to become 470?

6. By what is 120 multiplied to get 12000?

7. By what is 421 multiplied to produce 42100?

8. Multiply 19 by 7; by 8; by 9; by 6; by 10; by 12.

9. Write the multiplication table of 4's in four forms.

10. Add 6 to 13; to 17; to 23; to 27; to 36; to 48; to 59.

11. If the sun rises at half past six o'clock in the morning and sets at six in the afternoon, how long is it from sunrise to sunset? How long is it from sunset to sunrise?

12. If the sun rises at 7 and sets at half past 5, how long is it from sunrise to sunset?

13. In what month are the days longest? When are they shortest?

14. How old shall you be two years from now?

15. What year will it be?

16. What is the sum of 7, 8, 9, 10, 11, 12, and 13?

17. Ethel was 7 years old 5 years ago; how old is she now?

18. How old is a young man who will be old enough to vote in 2 years?

19. How old must a man be in order to vote?

20. If a watermelon is cut into four equal pieces, what part of the melon is one piece?

LESSON LXII.

1. How is a morning hour distinguished from a corresponding afternoon hour?

2. What does 9 A.M. mean? 9 P.M.? 12 M.?

3. M. means "meridian," and the meridian is an imaginary line passing north and south directly overhead. At noon the sun is on our meridian, and at all places directly north or south of us it is also noon, and at *no* other places is it noon at the same time. When it is noon here it is afternoon at all places east of here, and before noon at all places west of here.

4. When it is noon at New York is it forenoon or afternoon at Chicago?

5. When it is noon at Chicago is it morning or afternoon at New York?

6. Can you mention any other city where it is noon when it is noon at Albany, the capital of New York State?

7. When it is noon at Boston is it before noon or after noon at San Francisco?

8. When it is noon at San Francisco is it before noon or after noon at Salt Lake City?

9. "*Ante-Meridian*," or its abbreviation A.M., means before noon. "*Post-Meridian*," or its abbreviation P.M., means after noon.

10. If the difference in time between Portland, Maine, and Portland, Oregon, is three hours and a half, what time is it in Portland, Oregon, when it is noon in Portland, Maine?

11. When it is noon in the western city named what time is it in the eastern city?

12. Does the sun rise first on the Atlantic coast of the United States or at the Mississippi River?

13. Does it set first in Maine or in California?

14. When the sun is setting at San Francisco is it night or day at Washington?

15. When the sun is setting at Washington is it night or day at San Francisco?

16. Is it night or day in New England when it is sunrise in England?

LESSON LXIII.

1. What does "ante-meridian" mean?

2. What does "post-meridian" mean?

3. What does "meridian" mean?

4. What is the abbreviation of ante-meridian? for post-meridian? for meridian?

5. Find a country on the globe which is on the meridian directly opposite the meridian on which you live.

6. Name all the countries on that meridian.

7. When it is noon here what time is it on the meridian which you have found?

8. When it is midnight here what time is it on that meridian?

9. Queen Elizabeth died in the year 1603. How many years since her death? In what century did she die? In what century was she born?

10. Her father, Henry VIII, died in the year 1547; how many years did his death occur before that of his daughter? In what century did he die? How long since his death?

11. How many 5-cent horse-car tickets can you buy for 2 dollars?

12. If the fare is 6 cents without a ticket, how much is saved in a dollar's worth of tickets?

13. Mrs. Dudley made cheeses which weighed forty pounds apiece, and her neighbor, Mrs. Wilson, made cheese which weighed fifty-two pounds. They each made twenty-five cheeses during the summer, and each sold all but one. How much more did

Mrs. Wilson's bring than Mrs. Dudley's, at 13 cts. a pound?

14. By what is cheese weighed?

15. Give the table of Avoirdupois Weight.

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LESSON LXIV.

1. What part of 24 is 12? *Answer.* 12 is ½ of 24.

2. What part of 24 is 8? *Solution.* $24 \div 8 = 3$, hence 8 is ⅓ of 24.

3. What part of 24 is 6? is 4? is 3? is 2?

4. What part of 48 is 12? is 2? is 3? is 8? is 4? is 16?

5. What is ½ of 100? of 50? of 10? of 36? of 72? of 75? of 3? of 9? of 44? of 25? of 37? of 86?

6. What is ⅓ of 100? *Answer.* ⅓ of 100 is 33⅓, or 33⅓ is ⅓ of 100.

7. What is ⅓ of 60? of 36? of 9? of 27? of 28?

8. What part of 60 is 15? is 4? is 20? is 30? is 5? is 12?

9. What is $\frac{1}{10}$ of 20? of 100? of 30? of 50?

10. How do you find ½ of a number? ⅓ of a number? ¼ of a number?

11. Give ½ of some number, *e.g.*, 6 is ½ of 12, or 20 is ½ of 40.

12. Give ⅓ of some number. Give ½ of the same number.

13. Give ¼ of some number. ½ of the same number.

14. Give $\frac{1}{10}$ of some number.

15. If you pay $2.00 for a railway ticket for 50 miles, what is the rate per mile?

16. What would be the cost of Histories for all your class, including the teacher, at 75 cents apiece?

17. If it costs 75 cents to "shoe a horse" all around, what does shoeing one foot cost?

18. Do you think the blacksmith would charge 18 or 19 cents?

19. What would it cost to shoe a troop of 100 cavalry horses at the above rate?

20. At 40 cents a pound, how much tobacco could be bought for a thousand dollars?

21. If a man smokes three ten-cent cigars every day, what do his cigars cost him a week? How much a year? How many books at one dollar apiece could he buy with the money expended for cigars in one year? At that rate how many years would it take to smoke a thousand dollars' worth of cigars?

LESSON LXV.

1. Subtract 375 from 12036, proving the operation by addition. Perform the same examples again, and prove the work by subtracting the answer from the larger number.

2. Write the even numbers from 10 to 30 in a column, and divide each by 2.

3. Express in figures one billion three hundred million one thousand.

4. Write the ordinal numbers from 50 to 60 in words and with figures.

5. How many are:

125 + 10?	140 + 10?	131 + 10?	67 + 10?
125 + 9?	140 + 9?	131 + 9?	67 + 9?

6. After buying eighty cents' worth of spices, Libby received from the grocer a dollar and twenty cents in change. How much money had Libby handed the grocer?

7. How many five-cent pieces make a quarter of a dollar? How many make half a dollar? How many make a dollar?

8. How many 25-cent pieces make 3 dollars?

9. How many ten-cent pieces make a dollar?

10. How many dollars in the gold piece called an eagle?

11. What is metal called which is stamped and used as money?

12. Write the names of all the different pieces of coin you can recall; of as many metals as you know.

13. Where is United States money coined?

14. You can learn about the coining of money in the Cyclopædia under the word "mint."

15. Did you ever visit a mint?

16. How many mints are there for coining United States money?

17. If the mint at Philadelphia coins forty-five million dollars a year, and the mint at San Francisco ten million five hundred thousand, how much greater is the coinage of the Philadelphia mint than that of the San Francisco mint?

18. How many dollars in a half-eagle? in a double eagle?

LESSON LXVI.

1. Is United States money used in England, or in any foreign country?

In the Dictionary you will find tables of the money used in all the different countries of the world.

2. If you were travelling in Europe, could you use the money which you use here in the United States?

3. Could you get your money changed into that of each country you wished to visit?

4. What is the money used in England called?

5. Give the table of English Money.

6. Make the character which in this table indicates pounds.

7. For what word does £ stand?

8. "Libra" is a Latin word signifying a pound.

9. The English coin called a sovereign is of nearly the same value as our half-eagle, which is, as you remember, five dollars.

10. If a sovereign, which is one pound, has nearly the value of our five-dollar gold-piece, and there are twenty shillings in a pound, what is the value of an English shilling in our money?

11. How many 25-cent pieces in five dollars?

12. How many shillings in a sovereign?

13. Henry bought a coat for $18.00. He paid the salesman of whom he purchased the coat a double eagle; how much change was due him?

14. Is paper money coin?

15. Is a ten-dollar bill an eagle?

16. If Seth and one of his playmates each raise 28 goslings and sell them for $37\frac{1}{2}$ cts. apiece, how much money will they both have? How much will Seth have? How much will Seth's friend have?

LESSON LXVII.

1. Add 200, 300, 600, 700, 500, and 100, using the signs of addition and equality.

2. Write in words 200; 640; 2640; 84000; 70000; 1884.

3. Write the multiplication table as far as "12 times 12" in a square.

$27 - 10 = ?$ $32 - 10 = ?$ $44 - 10 = ?$ $67 - 10 = ?$
$27 - 9 = ?$ $32 - 9 = ?$ $44 - 9 = ?$ $67 - 9 = ?$
$27 - 11 = ?$ $32 - 11 = ?$ $44 - 11 = ?$ $67 - 11 = ?$

4. Give $\frac{1}{2}$ of all the even numbers from 2 to 30; thus:

1 is $\frac{1}{2}$ of 2.
2 is $\frac{1}{2}$ of 4.
3 is $\frac{1}{2}$ of 6.
etc.

5. Why is 11 an odd number?

6. Is 100 an odd or an even number?

7. Can you give a number which is neither odd nor even?

8. Are all numbers either odd or even?

9. Mr. Woodill put twenty-four quarts of water in the tank. Nellie drew a glass of water to drink, and carelessly forgot to turn the faucet, which remained open until some one noticed the water on the floor, by which time half the water had run out; how much was left in the tank? How many pints had run out?

10. If you had $1.50 and should lose one-half of it, how much would you have left? How much would you lose?

11. If your teacher had 50 peaches and should divide them equally among the members of your arithmetic class, how many would each receive? Would there be any left for the teacher?

LESSON LXVIII.

1. Zero is how many degrees below freezing point?

2. How many degrees below freezing point is 12° below zero?

3. Divide 36 by 8; 793 by 57.

4. Multiply 9 by itself; 8 by itself; 12 by itself; 15 by itself; 25 by itself.

5. Multiply 367 by 100; 42 by 1000; 864 by 10.

6. Divide 3260 by 10; thus, $3260 \div 10 = 326$.

7. Divide 8647 by 10; thus, $8647 \div 10 = 864\frac{7}{10}$.

8. Divide 97 by 10; 829 by 10; 923 by 10; 86492 by 1000.

9. How many days has February in a common year?

10. How many in Leap year?

11. How many Leap years in 24 years?

12. If the first day of the month is Monday, what day of the month is the next Monday? the third Monday? the fourth Monday?

13. Write and repeat the multiplication table of 8's.

14. Write 1884 in Roman capitals.

15. It is 297 miles from Portland, Maine, to Montreal, Canada, by the Grand Trunk Railroad; — miles from Montreal to Chicago; how far is it from Portland to Chicago *via* the G. T. R. R.?

16. The Brooklyn Bridge is one mile in length; what is the length in feet?

17. Standing at the middle of the bridge, how many feet distant are you from either end?

18. What is the measure for distance?

19. How many feet in half a mile? How many rods? How many rods in a quarter of a mile?

20. Ask your teacher to tell you some familiar point which is about $\frac{1}{4}$ of a mile from the school building.

LESSON LXIX.

1. $30 \div 15 = ?$
$45 \div 15 = ?$
$75 \div 15 = ?$
$60 \div 15 = ?$
$90 \div 15 = ?$

$40 \div 20 = ?$
$60 \div 20 = ?$
$80 \div 20 = ?$
$100 \div 20 = ?$
$200 \div 20 = ?$

$32 \div 16 = ?$
$48 \div 16 = ?$
$64 \div 16 = ?$
$80 \div 16 = ?$
$96 \div 16 = ?$

$26 \div 13 = ?$ $39 \div 13 = ?$ $52 \div 13 = ?$
$65 \div 13 = ?$ $78 \div 13 = ?$ $13 \div 13 = ?$

2. Count backward by 5's from 100 to 5.
3. Write the ordinal numbers from 30 to 35.
4. Why is 100 an even number?
5. Write and repeat the division table of 7's.
6. Double the numbers from 13 to 19 inclusive.
7. Write the numbers from 20 to 30 in a column, and add 20 to each.
8. The centre chandelier in a certain theatre has four rows of gas-burners. The lower row has 24 burners; the next row above has 16 burners; the third row has half as many as the first; and the fourth row has half as many as the second. How many burners are there in the four rows? How many in the two lower rows?
9. Cassius is 6 feet and 2 inches tall, John is 5 feet 11 inches, and Benjamin is just 6 feet. How much taller is Cassius than Benjamin? Benjamin than John? Cassius than John? How much taller is Benjamin than you?
10. How many inches in a foot?
11. Give the table of Long Measure.

LESSON LXX.

1. Express by addition and by multiplication that four 16's make 64; thus, $16 + 16 + 16 + 16 = 64$, and 4 times 16 are 64.

2. Express by addition and by multiplication that two 50's make 100; thus, $50 + 50 = 100$, and $50 \times 2 = 100$.

3. Express by addition and by multiplication that five 25's make 125.

4. Harry found a half-eagle on the street one morning when he was going to school. How many dollars did he find?

5. How many dollars in a double eagle?

6. How many dollars in a quarter-eagle?

7. Did you ever see a 2-dollar-and-a-half gold-piece?

8. Mention all the different coins you can remember having seen.

9. If Dick and Oliver go into partnership snaring rabbits, and Dick spends \$2.00 and Oliver spends \$1.00, what share of the profits will each have? If they make \$15.00 during the season, how much of the profits will Oliver have? How much will Dick have?

10. What is $\frac{1}{3}$ of 15? $\frac{2}{3}$ of 15?

11. If Mr. Rice and Mr. Hunter put \$1000 into a partnership business, each putting in the same amount, what share of the profits will Mr. Rice have? If the profits are \$800.00 the first year, what is Mr. Hunter's share?

12. In what latitude is Havana?

13. How many degrees south of Niagara Falls is Havana?

14. The city of Philadelphia keeps 200 mules and 300 horses to work on the streets and public parks.

What will it cost to feed them one year if each cost $2.00 a week? How much are they worth at $75.00 apiece for the mules, and $125.00 apiece for the horses?

LESSON LXXI.

1. Write in words the following with their answers:

$3 \times 25 = ?$
$100 \div 5 = ?$
$\frac{1}{2}$ of 90 is?
50 from 125 leaves?
$37 \times 100 = ?$
$75 + 75 = ?$
$36 - 34 = ?$
12 in 100 = ?
32 less 16 = ?
19 from 33 leaves?
19 and 19 are?
17 plus 16?
45 minus 25 = ?
4 times 16 are?
$19 + 20 = ?$
17 subtracted from 30 leaves?
1000 divided by 2 equals?
One-third of 300 is?
16 multiplied by $\frac{1}{2}$ equals?
75 subtracted from 150 leaves?
15 will go in 45?
Twice 35 are?
30 and 30 and 80 are?
300 and 500 are?
17 is $\frac{1}{2}$ of?
12 is $\frac{1}{3}$ of?
21 subtracted from 21 leaves?
100 taken from 1000 leaves?

2. How far will a canal-boat go in a day of 15 hours, at 4 miles an hour?

3. How many times do you think the horses would be changed in 60 miles?

4. How many days do you think it takes to go from Boston to Niagara Falls by rail?

5. How many days do you think it used to take

when there were no railroads, and the stages made about 50 miles a day from Boston to Albany, and the canal boats made 4 miles an hour from Albany to Niagara?

6. Mr. Hudson has ten fine paintings; how much must he get apiece for them in order to realize $500 from their sale?

7. Divide 36487912 by 391.

8. Write or repeat the table of Apothecaries' Weight.

LESSON LXXII.

1. 13 and 10 are 23, 13 and 9 are one less than 23, and 13 and 11 are one more than 23; hence 13 and 9 are 22, and 13 and 11 are 24.

2. In the same way perform the following without counters or marks.

3. How many are 18 and 10? 18 and 9? 18 and 11?

$17 + 10 = ?$ $25 + 10 = ?$ $28 + 10 = ?$ $44 + 10 = ?$
$17 + 9 = ?$ $25 + 9 = ?$ $28 + 9 = ?$ $44 + 9 = ?$
$17 + 11 = ?$ $25 + 11 = ?$ $28 + 11 = ?$ $44 + 11 = ?$

4. 10 from 25 leaves 15, 9 from 25 leaves one more than 15, and 11 from 25 leaves one less than 15; hence 9 from 25 leaves 16, and 11 from 25 leaves 14.

5. $28 - 10 = ?$ $13 - 10 = ?$ $36 - 10 = ?$
$28 - 9 = ?$ $13 - 9 = ?$ $36 - 9 = ?$
$28 - 11 = ?$ $13 - 11 = ?$ $36 - 11 = ?$

6. 9, 10, and 11 are 3 times what number?

7. Add the following, adding the 9's as above:

3	12	3	9	3	9
4	9	9	8	7	8
7	10	7	9	9	9
9	11	9	4	10	9
10	9	6	5	9	9
11	8	9	7	5	9
9	3	8	9	7	11
8	9	9	9	9	8
9	6	12	9	10	9
9	3	11	10	9	10
10	9	9	2	11	3
7	10	9	11	9	11
—	—	—	—	—	—

8. Subtract the following:

84 − 10. 96 − 10. 37 − 10. 42 − 10. 18 − 10.
84 − 9. 96 − 9. 37 − 9. 42 − 9. 18 − 9.
84 − 11. 96 − 11. 37 − 11. 42 − 11. 18 − 11.

9. Divide 896372564 by 27.

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LESSON LXXIII.

1. 25 is $\frac{1}{\text{fourth}}$ of what number?

2. 50 is $\frac{1}{\text{tenth}}$ of what number?

3. 19 is $\frac{1}{\text{half}}$ of what number?

4. If 9 is $\frac{1}{\text{third}}$ of 27, what is $\frac{2}{\text{thirds}}$ of 27? *Answer.* 18 is $\frac{2}{\text{thirds}}$ of 27.

5. If 4 is $\frac{1}{\text{third}}$ of 12, what is $\frac{2}{\text{thirds}}$ of 12?

6. Jerry's grandmother knit two pairs of mittens for him and two pairs for his brother every winter, from the time Jerry was five years old until he was twelve. How many mittens did she knit for both her grandsons? How many pairs did she knit? How many pairs for each boy?

7. Clarence bought 3½ yards of cloth, Andrew 2½ yards, and George 2½ yards, all from the same piece of goods, and worth $4.50 a yard. How much cloth did the boys buy? What was the whole cost? How much did Clarence pay? How much did George pay? How much more did Clarence pay than Andrew?

8. Bert bought a gun for $10.00, a powder-flask for $0.25, and a shot-bag for $0.50. During the year he spent $5.00 for powder, $4.00 for shot, $2.00 for caps, $1.00 for a trap, and $1.00 for fishing tackle. How much did Bert's sport cost him for the year?

9. What will be the cost of a pair of gold bracelets weighing 18 pennyweights apiece at a dollar and a quarter a pennyweight?

10. By what weight is gold weighed?

11. Give the table of Troy Weight.

12. What would be the cost of half a gross of silver spoons, each weighing 3 ounces, at $2.00 an ounce?

LESSON LXXIV.

1. Divide 23 billion 27 million 127 thousand 375 by 2 thousand 248.

2. Give the multiplication table of 10's in four forms.

3. Give the division table of 9's in four forms.

4. How many are 24 and 10? 24 and 9? 24 and 11? 10 from 24 leaves how many? 9 from 24? 11 from 24?

5. How much must be paid for a diamond ring the setting of which is worth $25.00, with one large stone worth $195.00, and five small stones worth $20.00 apiece?

6. Charley went to the circus with his father, and saw six elephants, two tigers, a panther, two lions, twenty monkeys, ten camels, a bear, a baboon, two black foxes, a hippopotamus, two leopards, a zebra, and a giraffe or camelopard. How many animals did Charley see in the menagerie? In the circus he saw fifteen trained horses, six ponies, and ten saddle horses, and beside these, his father told him, there were thirty draught horses. How many cages do you think Charley saw in the menagerie? How many horses were there belonging to the circus?

7. What will a single photograph cost at $8.00 a dozen?

8. How many are three scores and ten?

9. What fractional part of a score is 10?

10. Express 45 in scores; 25; 40; 60; 95; 100; 21; 46; 37; 62; 77; 10; 80; 70.

11. What time is it when the hour-hand of a watch is between 6 and 7 and the minute-hand is at 3?

12. Where are the hands of a watch at 25 minutes past 10?

13. Where are the hands of the clock at 10 minutes of 4?

14. Where are the hands of the clock at midnight?

15. Draw the face of a clock with the hands at a quarter of 5.

LESSON LXXV.

1. Write in Roman characters the year in which Abraham Lincoln died.

2. Double 307096421, and prove the work by division.

3. How do you find $\frac{1}{7}$ of 210?

4. What is $\frac{1}{7}$ of 210?

5. What is one-tenth of 1000? $\frac{1}{2}$ of 250?

6. Thomas bought a kit of tools, paying 50 cents for a hammer, a dollar and a quarter for a saw, 75 cents for a file, 25 cents for a gimlet, 25 cents for a screw-driver, 25 cents for a punch, a dollar for an auger, 50 cents for a chisel, a dollar and a half for a spirit-level, 25 cents for an awl, 2 dollars for a jack-plane, 35 cents for a drill, 50 cents for compasses, 40 cents for pincers, 62 cents for a wrench, one dollar for a pocket knife, and 75 cents for a whetstone. What did the whole cost?

7. If Thomas should sell all the tools for $15.00 and buy another set for $10.00, how much would he gain by the transaction?

8. If a cotton-mill has 500 looms, and 2 yards of cotton are woven on each loom every day, how many yards are woven in the mill during the month of

April? For how much would the cotton sell at 7 cts. per yard?

9. If the Philadelphia and Camden ferry-boats leave opposite slips every 6 minutes, how many trips are made each way in an hour? How many trips both ways?

10. How long is the Brooklyn Suspension Bridge in feet?

11. How long is the Victoria Bridge? You will find descriptions of these bridges in the Cyclopædia.

12. How many feet in a mile?

13. How many feet in a rod? in 80 rods?

14. How many rods in half a mile?

15. Give the table of Long Measure.

LESSON LXXVI.

1. Fill blanks, and write answers to the following:

2. — is how many more than —?

3. — is how many less than —?

4. How many times will — go in twice —?

5. How many are — times — plus —?

6. What number added to itself amounts to —?

7. What time is it when the hour-hand and minute-hand of a clock are at —?

8. What number divided by — equals —?

9. — in — how many times?

10. — is what part of —?

11. Give and perform a problem in which 4 × 9 is subtracted from 40.

12. — from — leaves how many times — ?
13. Count by —'s from — to —.
14. Double a number containing five figures.
15. How do you find one-half of a number?
16. How many — cent pieces in — dollars?
17. Perform an example in long division.
18. Give and solve a problem in which 12 + 8 + 10 is doubled.
19. — + — = how many?
20. — × — = how many?
21. — is — more than what number?
22. Hans, Robert, and Fritz had each — marbles. Hans won — marbles from Robert and the same number from Fritz; how many marbles did he then have?
23. If raisins are — cents a pound, how many pounds can be bought for — dollars?

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LESSON LXXVII.

1. What number multiplied by itself gives — ?
2. — divided by — is how many?
3. How many is — divided by — ?
4. How many are — less — less — ?
5. How many are — minus — plus — minus — ?
6. — taken from — leaves how many?
7. — is one-half of what number?
8. What number is one-third of — ?
9. How many are — times nothing?
10. Take — plus — from —.

11. — added to itself equals how many?

12. Which is most —, —, or —?

13. — subtracted from itself leaves how many?

14. What is one-half of — times —?

15. What number is only one-half of —?

16. — is — of what number?

17. How do you find one —th of a number?

18. What number is — times as great as —?

19. How many —'s and how many over is —?

20. — from — leaves how many times —?

21. How many degrees colder is the temperature with the thermometer at —° than at —°?

22. How many degrees south of Philadelphia is New Orleans?

23. How many miles in 18 degrees of latitude?

24. A fruit-dealer bought — crates of peaches at — a crate. What was the cost of the whole?

25. Divide a number consisting of 10 figures by — by short division.

LESSON LXXVIII.

1. Is a number multiplied or divided by adding a cipher to its right?

2. Is a number multiplied or divided by cutting off one figure from its right?

3. $3600 \div 10 = ?$ $\quad 370 \times 10 = ?$
$3610 \div 10 = ?$ $\quad 19 \times 1000 = ?$
$4800 \div 100 = ?$ $\quad 26 \times 100 = ?$
$48000 \div 10 = ?$ $\quad 42 \times 10 = ?$

480000 ÷ 1000 = ?
92000 ÷ 100 = ?
270 ÷ 10 = ?
270 ÷ 100 = ?
400 ÷ 10 = ?

86 × 100 = ?
390 × 10 = ?
400 ÷ 10 = ?
4000 ÷ 100 = ?
7400 ÷ 10 = ?

4. If an opera house standing on a corner has twelve entrance doors on both streets, an equal number on each street, how many doors are there in front?

5. Give the multiplication table of 12's.

6. What is one-half of 23740? Prove the work.

7. How many less days are there in April, May, and June than in July, August, and September? How many days in all these months?

8. Mr. French was to give a course of 6 stereopticon lectures, but twice he was ill and failed to appear. Mr. Stoddard advertised one less lecture than Mr. French, but gave all he advertised to give. How many lectures did they both give? Which gave the greater number?

9. How many pages in a book of 375 leaves?

10. The dictionary cost $10.75, which was double the price of the Gazetteer; what did the latter cost?

11. Fred weighs 180 pounds, Sammie weighs half as much as Fred, and Ethel weighs a quarter as much as Fred; how much do they all weigh?

12. The ladies of the Diet Mission sent food to 60 poor people one winter, which was double the number on their books the winter before; how many did they help the first winter?

LESSON LXXIX.

1. How many years in the Christian Era before the beginning of the 20th century?

2. In what century was the War of the American Revolution?

3. In what century was the War of the Southern Rebellion?

4. What is the present century?

5. How many years in two centuries?

6. How many centuries in a thousand years? in four hundred years? in six hundred years? in eighteen hundred years? in nine hundred years? in twelve hundred?

7. What part of a century is fifty years? is twenty-five years?

8. What was the last year of the 5th century?

9. What was the first year of the 19th century? the 20th year of the 15th century?

10. How many centuries from 650 to 1850? from 1700 to 1800? from 1550 to 1600? from 1200 to 1650? from 500 to 1425?

11. Ruby and Nelson visited the Art Exhibition 5 times. They saw 50 landscapes, 5 winter scenes, 10 marines, 25 studies, 8 fruit and flower pictures, 7 interiors, 13 still-life pictures, 18 animals, 7 street scenes, 14 heads, 10 character scenes, and 28 miscellaneous pictures, in oils. In water-colors there were 25 landscapes, 2 marines, 8 portraits, and 15 studies. In "black and white" there were 10 landscapes, 12 portraits, 20 studies, 7 still-life pictures, 8 animals,

and 19 miscellaneous pictures. How many pictures in the exhibition? How many more oil-paintings than water-colors? How many more water-colors than pictures in "black and white"? How many more oil-paintings than pictures in "black and white"?

LESSON LXXX.

1. Fill out and perform the following.
2. How many times will — go in 100?
3. What remains after subtracting — from 75?
4. — is — less than 24.
5. — is — more than 24.
6. What number subtracted from — leaves 22?
7. To what must — be added to make 75?
8. What is one-half of — times 12?
9. — from — leaves 37.
10. — is — less than twice 15.
11. — added to itself equals 38.
12. How much more is — × — than 50?
13. — is $\frac{1}{\text{th}}$ of 50.
14. What number will go — times in 96?
15. — is $\frac{1}{2}$ of 500.
16. — is $\frac{1}{8}$ of 30.
17. How many —'s and how many over is 49?
18. How many must be added to — to give 40?
19. — plus — minus — are 15.
20. — and — and — and — are 80.
21. How many —'s in 100?
22. What is the product of — multiplied by 12?

23. — multiplied by — equals 56.
24. How many are — times 16?
25. How much is — subtracted from 60?
26. How many more is — than 36?
27. What number added to — gives 75?

LESSON LXXXI.

1. By what is a number divided to find one-half of it? By what to find one-tenth? to find one-seventh? to find one-twentieth?

2. By what do you divide to find $\frac{1}{\text{third}}$ of a number? $\frac{1}{\text{fourth}}$? $\frac{1}{\text{eleventh}}$?

3. By what do you divide to find $\frac{1}{21}$ of a number? $\frac{1}{100}$? $\frac{1}{16}$? $\frac{1}{8}$? $\frac{1}{5}$?

4. What number multiplied by itself gives 144? 225? 625?

5. What number added to itself gives 90? 70? 38? 26?

6. Write the multiplication table as far as "9 times 9" in a square.

7. Divide 96 by all its divisors.

8. Divide 364879132 by 2384.

9. How much more is the population of the State of New York than of Vermont?

10. The great painter, sculptor, and architect, Michael Angelo, died at the age of 90 years. Raphael died when he was only 37. How much older was Michael Angelo at the time of his death than was Raphael when he died?

11. Michael Angelo was born in the year 1475; Raphael in 1483. How old was Michael Angelo when Raphael was born? How old was he when Raphael died? In what century were they born? In what century did they die? In what year did Michael Angelo die? In what year did Raphael die? How many years since Raphael's death?

12. Henry buys a pack of 144 visiting cards for 50 cents. He either writes or prints them as his customers order, and gets 24 cents a dozen. How much does he get for his work per pack?

13. What is $\frac{1}{\text{half}}$ of 250?

14. Write in figures XXVI; LXIX; CXXVIII; MCXLV.

15. How many volumes in a bookcase having 8 shelves, with 30 books on a shelf, and two drawers, one containing 10 large volumes and the other 15 volumes?

LESSON LXXXII.

1. How many characters are used in writing numbers by the Arabic method?

2. How many by the Roman?

3. Make the signs used to indicate United States money; the English pound sterling; a degree; addition; subtraction; multiplication; division.

4. Make the sign used to point off periods in notation; to separate dollars and cents; to express equality.

5. When $1 is paid for one cord foot of wood prepared for the stove, what must be paid for one cord?

6. How many cord feet in a cord? How high is a cord foot? How long is the wood? How long is the pile?

7. Make a drawing of a cord of wood on your slate, and divide it into 8 cord feet.

8. What part of a cord is 1 cord foot?

9. What part of a cord are 4 cord feet? 2 cord feet?

10. What will one dozen and a half of lamb's-wool erasers, or slate brushes, cost at $12\frac{1}{2}$ cents apiece?

11. How many 2-cent postage stamps can you get for an eagle? How many postal cards?

12. What will a ream of foolscap paper cost at $12\frac{1}{2}$ cents a quire?

13. If a fox runs 5 miles in half an hour and a hound runs 6 miles in the same time, how much farther will the hound run in 1 hour than the fox? If the fox starts 4 miles ahead of the dog, how many hours will it take the dog to overtake the fox?

14. If it is now 11 A.M., how long before the 2.30 P.M. train goes?

15. Give the division table of 8's.

16. Which is the more, a five-dollar bill and a two-dollar bill and a one-dollar bill, or an eagle?

LESSON LXXXIII.

1. How do you find $\frac{2}{3}$ of a number? *Answer.* I find $\frac{2}{3}$ of a number by dividing the number by 3, and multiplying the result by 2.

2. How do you find $\frac{3}{4}$ of a number? $\frac{2}{5}$ of a number? $\frac{2}{7}$ of a number? $\frac{5}{7}$ of a number? $\frac{1}{10}$ of a number? $\frac{4}{7}$ of a number? $\frac{1}{12}$ of a number?

3. If a well is dug 80 feet deep, and the stones and curb are raised 4 feet from the ground, how far is the bottom of the well from the top of the well-curb? If there are 12 feet of water in the well, how far is it to the top of the curb from the surface of the water? How far is the surface of the water below the ground? How far is the surface of the water above the bottom of the well? If the digging of the well cost $15.00, the stoning $10.00, the levelling, sodding, and putting down the curb-stones $5.00, and if the curb cost $5.00, the windlass $1.00, and the bucket $1.25, what was the entire cost?

4. Charlotte bought a stick of sealing wax for ten cents, a seal for half a dollar, a taper for five cents, and a bunch of matches for one cent. After sealing one letter she sold the whole to her brother Clayton for seventy-five cents. How much money will she have left after buying four bunches of envelopes at ten cents a bunch?

5. How long will five dollars last Jeanne for flowers if she buys twenty-five cents' worth twice a week?

6. In one of Salvator Rosa's beautiful landscapes there are three cows standing in a brook in the foreground, two cows, five sheep, and a goat feeding by a stream farther away, and one cow lying down in the shade of a tree near them. A band of five robbers are hiding under the overhanging rocks

waiting to attack some travellers who are approaching, and whom they intend to rob. The carriage, containing two ladies, three gentlemen, and a driver, is just coming into view in the distance, drawn by four handsome horses. How many persons in the picture? How many animals? How many more robbers than gentlemen?

LESSON LXXXIV.

1. Divide 12 quadrillion 125 trillion 37 billion 364 million 46 thousand one hundred and thirty by eight.

2. What is $\frac{1}{10}$ of 30? $\frac{2}{10}$ of 30? $\frac{3}{10}$ of 30? $\frac{4}{10}$ of 30? $\frac{5}{10}$ of 30? $\frac{6}{10}$ of 30? $\frac{7}{10}$ of 30?

3. How many are:

17 and 10?
17 and 9?
17 and 11?
24 and 10?
24 and 9?
24 and 11?
32 and 10?
32 and 9?
32 and 11?

4. 10 from 36 leaves how many?

9 from 36?
11 from 36?
10 from 75?
9 from 75?
11 from 75?

5. How much did Sidney put in the Savings Bank in 5 years if he put in $25.00 the first year, $50.00 the next year, and each year following twice as much as the year before?

6. If every member of your class should put one cent in the poor-box every day, to what would it amount in one year?

7. Walter had 75 cents in his bank. He took out one-third of it to buy a bow and arrow, and his cousin Hattie dropped in 10 cents, and Hattie's mother twice as much as Hattie. How much was there then in Walter's bank?

8. Rollo counted 25 windmills between Rotterdam and The Hague, and 40 between The Hague and Amsterdam. How many windmills did Rollo count? If there were as many more on the other side of the train which Rollo did not count, and each windmill had 4 arms, how many arms on all the windmills between Rotterdam and Amsterdam?

9. Frankie broke the crystal and main-spring of his watch; what would be the expense of getting the watch repaired if the main-spring cost one dollar, the crystal one-half as much as the main-spring, and cleaning as much as both the main-spring and crystal?

LESSON LXXXV.

1. If you should read 6 pages of History on Monday, 8 pages on Tuesday, and 10 pages on Wednesday, should you read more or less than if you had read 8 pages each day?

2. You read, on an average, how many pages each day?

3. If you were to walk 10 miles one day, 12 the next, 14 the next, and 12 the next, what would be the average number of miles that you would walk daily?

4. Alice bought a paper of pins containing 16 rows with 28 pins in a row. How long will it last if she uses a row every week? How many pins will she use on an average daily?

5. If the paper of pins cost 8 cents, how many rows are worth one cent? What part of a cent is one row worth?

6. How many mills in one-half cent?

7. Is there a piece of money of as little value as one mill?

8. Is there a coin as small as half a cent? Did you ever see one of the half-cent pieces which were in use many years ago?

9. Annie took 20 drawing lessons, 20 lessons in water colors, and 14 lessons in oil painting one winter. The next season she took the same number of drawing lessons, half as many lessons in water colors, and twice as many in oils. How many lessons did she take the second year?

10. Sarah wrote 5 letters one day, 7 the next day, and enough the third day to make an average of 7 letters daily; how many letters did she write on the third day?

11. If there are 12 present in class one day, 12 another day, and only 6 on the third day, what is the daily average? *Answer.* There are 30 present in 3 days, which makes a daily average of 10.

12. Mr. Thompson had 9 bushels of cranberries one year, 10 bushels the next year, and 11 bushels the next year; but the fourth year he had so few that the average for the four years was only 8 bushels; how many had he the last year?

LESSON LXXXVI.

1. If you wish to walk 40 miles in 10 days, how many miles must you average daily?

2. Saturday, Nov. 10th, 1883, was the 400th anniversary of the birth of Martin Luther, the great German reformer. In what year was he born? In what century was he born?

3. If a cabinet-maker requires six days in which to make a secretary, how many men must he employ to help him, in order to do the work in one day?

4. A gentleman died and left to each of his six children two hundred thousand dollars; what was the value of his estate?

5. Last year Mr. Torry paid 100 dollars in taxes on his house; his gas-bill, which was double his water-rate, was one-half as much as his taxes, and his coal-bill three-fourths as much. What was the amount of his tax, water-rate, gas, and coal bills?

6. If one colt is worth as much as two calves, how many colts could farmer Russel get in exchange for eight calves?

7. A chess-board has 8 rows of squares and 8 squares in a row; how many squares around the outside? How many squares from one corner across to the diagonally opposite corner? Draw a chess-board, and count the squares, if you cannot give the answer without doing so.

8. If it requires a gang of 7 men to lay a certain pavement in 2 days, how long will it take 1 man to do the same work? How long would 2 men require for the work?

LESSON LXXXVII.

1. If two men leave Chicago at the same time, one going east, at the rate of 90 miles a day, and the other going west, at the rate of 60 miles a day, how far apart are they at the end of 2 days? of 4 days? at the end of a week? How far from Chicago is the first man at the end of a week? If they had both gone west, how far apart would they have been at the end of the first day, supposing each had travelled at the rate named? How far apart at the end of 3 days?

2. It is half a mile from Mrs. Harper's to the school-house where Gracie Harper goes to school. One night Mrs. Harper started to meet Gracie just as Gracie left the school-house. Mrs. Harper walked 12 rods in one minute, and Gracie walked 8 rods in the same time; how many minutes before they met? How many rods from home were they when they met?

3. Robert and Lucius have a field of 60 cabbage-plants, of which 20 more belong to Robert than to Lucius. How many plants are Lucius'? How many are Robert's?

4. Carl Valentine was born on the 29th February. How many birthdays, including the day of his birth, had he had when he was 17 years old?

5. Give the table of Apothecaries' Weight.

6. What will a pound and a half of camphor-gum cost at 4½ cents an ounce?

7. Lois and Belle Brandon went to the marsh to

gather cat-tail flags. Lois got 27 and Belle got 9. How many must Lois give Belle in order that they may carry home an equal number?

8. How many rods in half a mile?

9. How far is it around a city block one-fourth of a mile on each side?

10. How many fourths in one mile?

11. If the circumference of a circle is 30 inches, what is the diameter?

12. Is the earth's equator the circumference or the diameter of a circle?

13. How many degrees from the Equator to the North Pole?

14. How many hours from 9.15 A.M. to 2.30 P.M.?

15. How many years from B.C. 130 to A.D. 1200?

16. How many years ago was an event which occurred B.C. 500?

17. Write the multiplication table as far as "12 times 12" in a square.

18. Divide 72 by all its divisors.

19. If Miss Allen copies 54 pages of manuscript in 6 days, what is the average number of pages copied daily?

20. At the time of the Revolutionary War the flag adopted by the Americans was of three colors, red, white and blue, and consisted of 13 stripes, 7 red and 6 white, and of 13 white stars on a blue field.

21. Do you know why 13 was chosen for the number of stars and stripes?

22. Write the names of the 13 original States.

23. A star has been added for every State which has been admitted into the Union since that time.

24. What is the present number of States?

25. How many stars on our national flag now?

26. How many more stars has the flag now than it had originally?

27. The stripes remain unchanged; how many stripes are there?

28. Draw the American flag.

29. An American girl was once asked by some English ladies, whom she met in the south of France, to draw for them the American flag, which she did. She drew the field of stars in the lower corner of the flag at the end next the flagstaff. Did she draw it correctly?

LESSON LXXXVIII.

1. Fill out and perform the following:
2. What number is — more than —?
3. — plus — minus — are how many?
4. — is how many more than —?
5. What part of — is 25?
6. How many times will — go in —?
7. — divided by — equals how many?
8. Add — and 367.
9. Subtract — from —.
10. — and — are 125.
11. What number added to — gives —?
12. What number is — times —?
13. Divide — by —.
14. — times — are how many?
15. How many more than — is —?

16. — is 12 less than —.
17. — added to itself equals 38.
18. — subtracted from itself leaves nothing.
19. — subtracted from 150 leaves nothing.
20. What number multiplied by itself equals —?
21. — divided by — equals 1.
22. — divided by itself equals 1.
23. 19 in — how many times?
24. — divided by — is how many?

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LESSON LXXXIX.

1. Fill out and perform the following:
2. What number is — less than —?
3. How many are — minus — plus — minus —?
4. How many are — minus — plus — minus — minus —?
5. — is how many more than —?
6. What part of 60 is —?
7. How many times will 12 go in —?
8. — divided by — equals 15.
9. Add — and — and —.
10. — from — leaves 40.
11. — added to — equals 27.
12. — times — are 96.
13. — divided by — equals 16.
14. How many are — times —?
15. How many less is — than —?
16. — is 20 more than —.
17. What number added to itself equals —?

18. What number subtracted from itself leaves — ?
19. — multiplied by itself equals 655.
20. What number divided by itself gives — ?
21. 16 in — how many times?
22. — in — how many times?
23. — in — 10 times.
24. 100 divided by — is how many?
25. 100 divided by — is 20.
26. — divided by — is 9.
27. 23 minus — equals how many?
28. — plus — equals 30.
29. — plus — equals how many?

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LESSON XC.

1. Fill out and perform the following:
2. How much is — divided by 25?
3. — from — leaves how many times 2?
4. How many are — subtracted from — ?
5. What is the sum of — plus — ?
6. — multiplied by — are how many?
7. — multiplied by — are 56.
8. — added to — are how many?
9. What is the amount of — plus — plus — ?
10. Multiply — by —.
11. Add — to itself.
12. What number subtracted from — leaves 12?
13. — subtracted from 75 leaves —.
14. A woman drove into town with a basket of — dozen eggs with which to buy a broom, a clothes-

wringer, and a tin bath. She sold her eggs at 20 cents a dozen for enough to pay for all these articles and had 50 cents left, with which she bought — pounds of sugar at — cents a pound. How many dozen eggs did she have? How much more did the wringer cost than the sugar?

15. What number multiplied by — gives —?
16. How many —'s in 21?
17. — is how many times —?
18. How many are — less —?
19. How many are — and — less —?
20. How many must be subtracted from — to leave —?
21. How many more are — and — than — and —?

* * *

LESSON XCI.

1. How many are — added to —?
2. — from — leaves 18.
3. — subtracted from — leaves 8.
4. — ÷ — = ?
5. — subtracted from — leaves how many?
6. — plus — equals 50.
7. 20 multiplied by — are —?
8. Multiply — by itself.
9. — multiplied by 4 gives how many?
10. What number divided by — gives —?
11. What is the product of — multiplied by 4?
12. What is the amount of — and — and — and 13?

13. How many 2's in — ?
14. — is how many times 8?
15. How many are — less 20?
16. How many are — less — less — ?
17. How many are — minus — plus — plus — ?
18. How many must be added to — to get — ?
19. How many less are — and — than — and — ?
20. How many are — minus — and — minus — ?
21. How many 5's and how many over in — ?
22. — taken from — leaves how many times — ?
23. Take — from twice —.
24. What is ½ of — ? of — ? of — ? of — ?
25. — is one-half of what number?
26. Count backwards from — to 20.
27. Count backwards from 20 to —.
28. What number is one-third of — ?
29. Double —.

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LESSON XCII.

1. Fill out and perform the following:
2. What number is doubled to give — ?
3. How do you find one-half of a number?
4. How do you find one-half of anything?
5. What number will go twice in — ?
6. What number will go — times in 64?
7. What number is one-fourth of — ?
8. What is the difference between — and — ?
9. — multiplied by itself equals how many?
10. — less — is how many?
11. How many — cent pieces in — dollars?

12. — added to itself equals how many?
13. Perform an example in short division.
14. — + — = how many?
15. — less — less — are how many?
16. — × — = how many?
17. — minus — is how many more than 8?
18. How many is 14 more than —?
19. — is — more than what number?
20. What is 15 more than —?
21. What number is — less than 22?
22. — is — more than how many?
23. How many less than 50 is —?
24. To what must — be added to give 19?
25. State and perform a problem multiplying 12 by 12.
26. Take — times — from — plus —.

* * *

LESSON XCIII.

1. Fill out and perform the following:
2. — divided by itself equals how many times 2?
3. Perform an example in long division.
4. — subtracted from itself leaves how many?
5. — less — less — are 8.
6. — is — less than what number?
7. What number is — more than 37?
8. What number is — less than —?
9. 125 is — more than 100.
10. — is 18 more than 18.

11. How many opera tickets can be bought for — dollars at — apiece?

12. How many more than 25 is —?

13. By what is 12 multiplied to produce —?

14. Give and perform a problem in which the process is 20 — (3 × 5).

15. What number is 10 times as great as —?

16. Take — plus — from — times —.

17. By what is — multiplied to produce 90?

18. How many are — times nothing?

19. What remains after subtracting — from —?

20. How much will — yards of lace cost at $1.87 a yard? How much would be left from a ten-dollar bill after paying for the lace?

21. Miss Hudson bought — yards of smilax at 15 cents a yard, — rosebuds at 10 cents apiece, and 25 cents' worth of other flowers; how much less than one dollar did the whole cost?

22. Miss True got — worth of flowers; how much more were Miss True's flowers than Miss Hudson's?

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LESSON XCIV.

1. Fill out and perform the following:

2. How many times will 17 go in —?

3. Divide — times — by — times —.

4. How many must be taken from — in order to leave only 1?

5. What number is one-half as great as —?

6. How many are — and — more than 9 times 12?

7. — and — and — are 3 times what number?

8. — is one — th of 60.

9. — is one — d of 39.

10. To what must twice 4 be added to make twice —?

11. What is one-tenth of —?

12. What time is it when the hour-hand of the clock is half way between — and — and the minute-hand is at —?

13. How many barrels of flour at — a barrel must be paid for — cords of wood at — a cord?

14. Mrs. York gave Tommy — cents an hour for weeding her flower-beds. How many days did it take Tommy to earn enough to buy a — dollar wheelbarrow if he worked — hours a day?

15. — boys and — girls put — cents apiece into the poor-box; how many times must the same sum be put into the box in order to get two dollars?

16. What is the average weight of Thanksgiving turkeys if — turkeys weigh 30 pounds?

17. Mr. Woodill sells all the old newspapers from the reading-room for 25 cents a hundred. How many hundred must he sell to pay for — books at — apiece?

18. Kate and Fannie wanted to buy a wax doll together. Kate had — cents, and Fannie had — cents; how much more did they have to get from their papa in order to have enough to pay $2.25 for the doll?

LANGUAGE LESSONS IN ARITHMETIC.

PART II.

SECTION I. — MISCELLANEOUS QUESTIONS.

LESSON I.

1. The science of numbers and the art of computing by them is called Arithmetic.

2. A single thing is called a "unit."

3. Several units taken together are called a "number."

4. How do you determine the number of units in a collection of single things or units?

5. Take up a handful of counters and place them on your desk.

6. Do you know at sight how many you took up?

7. How can you learn the number of counters which you have before you?

8. Count them and tell how many there are.

9. How many units in ten? in one hundred? in one thousand? in 500? in 1000000? in 3640? in L? in C? in CLXVII? in M?

10. How many characters are used in writing numbers with figures?

11. Make them.

12. All these characters except the cipher are called "significant figures."

13. How many of these ten characters are significant figures?

14. When the cipher stands alone, what is its value?

15. Upon which side of a significant figure must the cipher be placed in order to change the value of the figure?

16. What other names has the cipher?

17. Give an example in which the cipher would be read "nothing."

18. What is Arithmetic?

19. What is a number?

20. What is a unit?

21. What do we call the art of computing by numbers?

LESSON II.

1. When two or more numbers are added together to form one number, what is the process called?

2. What is the result called? *Answer.* The result is called the "answer," the "sum," or the "amount."

3. What is the process of adding two or more numbers together?

4. What is the process of taking one number from another?

5. When one number is taken from another, what is the result called? *Answer.* The result is called the "answer," the "difference," or the "remainder."

6. What is a process? *Answer.* A process is the work of performing an operation.

7. What is addition?

8. What is subtraction?

9. What is the sum of 379 and 560?

10. Of what is 939 the result in the above example?

11. Subtract 500 from 2000.

12. Of what is 1500 the result in the above?

13. What is the result of adding 200 and 300?

14. What is the result of subtracting 1000 from 1100?

15. Add two numbers which amount to 75.

16. Subtract from some number another number which shall leave a remainder of 10.

17. Add three numbers, the sum of which shall be 19.

18. What is the difference between 80 and 100?

19. What number added to itself gives 1000 for the amount?

20. 75 added to 75 equals how many? Write the answer in full, using figures and signs.

21. What number subtracted from 100 gives a remainder of 70? of 90? of 40? of 50? of 20?

22. What number must be added to 19 to get 38?

23. How many times greater is one thousand than one hundred?

24. How much larger is the sum of 25 and 25 than the difference between 50 and 75?

LESSON III.

1. What is the process of taking one number as many times as there are units in another number?

2. What is a process?

3. What is the process of dividing one number into as many equal parts as there are units in another number?

4. What is Addition?

5. What is Subtraction?

6. What is Multiplication?

7. What is Division?

8. What is the result of multiplying one number by another called? *Answer.* The result of multiplying one number by another is called the "answer" or the "product."

9. In the statement "10 times 10 are 100," what is the product?

10. Multiply 18 by some number which shall give 36 for a product.

11. What is the product of 25 multiplied by 8? by 10? by 100? by 20? by 200? by 3? by 30? by 300?

12. What is the result of dividing one number by another called? *Answer.* The result of dividing one number by another is called the "answer" or the "quotient."

13. In the statement "80 ÷ 4 = 20," what is the quotient?

14. What number divided by 3 gives 20 for a quotient?

15. Prove by subtraction that 75 added to 75 is 150.

16. Prove by addition that 20 subtracted from 115 leaves 95.

17. Prove by division that 25 times 25 are 625.

18. Prove by multiplication that 20 will go in 1000 50 times.

19. What is proving or testing an operation?

20. Divide a number containing four figures by a number containing two figures, and show whether the work is correct.

21. Multiply 1450 by a number containing two figures, and test the work.

22. Perform an operation in addition, and test it.

23. Perform and test an operation in subtraction.

LESSON IV.

1. Why is the method of expressing numbers by means of figures called the Arabic method?

2. Where is Arabia?

3. What other methods of representing numbers are in common use?

4. What characters are used in the Roman method of representing numbers?

5. Write the Roman capitals used to express numbers.

6. Which method is older, the Roman or the Arabic?

7. What other method have we of representing numbers?

8. Why is the representation of numbers by capital letters called the Roman method?

9. How can numbers be represented, using neither figures nor capital letters?

10. What is the process of expressing or writing numbers called?

11. What is the process of reading numbers called?

12. What is Arithmetic?

13. What is Addition? Subtraction? Multiplication? Division? Notation? Numeration?

14. If a number is so large that you cannot tell at sight what the figures represent, how do you point it off?

15. Write a number containing 15 figures, and point it off into periods of 3 figures each.

16. Which is the period of units? of thousands? of trillions? of millions? of billions?

17. Write a number of 20 places, and point it off into periods, writing over each period the name of that period.

18. What is the first period on the right? the second period? the fifth? the third? the seventh? the fourth? the sixth?

19. How many periods in a number containing 11 figures? in a number containing 12 figures? in a number of 17 figures? in a number of 14 figures? of 16 figures? of 25 figures?

20. Are the names of corresponding places the same in all the periods?

21. What is the left-hand place in every period? the middle place? the right-hand place?

22. Write in words 13468972.

23. Write in figures three hundred and nine trillion twenty-seven billion one hundred and sixty-eight million three hundred and thirteen thousand five hundred and twenty-one.

24. The right-hand place of the second period is units of thousands; what is the right-hand place of the third period? the left-hand place of the first period? the left-hand place of the fifth period? the middle place of the fourth period? the middle place of the second period? the right-hand place of the fifth period?

25. Write in words 8376542175346.

26. Write in words 3006700340000.

27. Write in figures 8 quintillion 17 quadrillion 142 trillion 16 billion and 9 million.

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LESSON V.

1. What is a character called which is used to indicate an arithmetical operation?

2. Make all the arithmetical signs you have ever used.

3. What is the name of the sign which indicates that the numbers between which it stands are to be added?

4. What is the name of the sign used to indicate that the number after it is to be subtracted from the number before it?

5. What sign is used to indicate that the number after it is to be multiplied by the number before it?

6. What sign is used to indicate that the number before it is to be divided by the number after it?

7. Describe the sign of addition, and illustrate its use.

8. Describe the sign of subtraction.

9. Describe the sign of multiplication.

10. Describe the sign of division.

11. Describe the sign of equality.

12. The upright or erect cross is called the Saint George's Cross, and is read "plus." Of what is the Saint George's Cross the sign?

13. What does it indicate? How is it read?

14. What is the sign called which is used to indicate that two or more numbers are to be added together?

15. The inclined or oblique cross is called Saint Andrew's Cross, and is read "times."

16. Make the sign of subtraction; of division.

17. Make the St. George's Cross.

18. Make the Saint Andrew's Cross.

19. Which cross is the sign of addition?

20. Of what is a short horizontal line the sign?

21. Of what is a horizontal line with a dot above and below the line a sign?

22. Of what are two short parallel horizontal lines the sign?

23. Draw a horizontal line; a vertical line; an

oblique line; two parallel horizontal lines; two parallel oblique lines; two parallel vertical lines.

24. Perform all the examples in your Common School Arithmetic under Addition, or examples which your teacher will give you.

25. Give the rule for proving addition as you find it in your Common School Arithmetic, or in the Appendix.

LESSON VI.

1. In subtraction the number subtracted is the subtrahend, the number from which the subtrahend is taken is the minuend, and the number resulting is the difference or remainder.

2. What is subtraction?

3. What is the sign of subtraction, and where is it placed?

4. What is the name of the number subtracted?

5. What is the name of the number from which the subtrahend is taken?

6. What is the name of the number left after subtracting one number from another?

7. In the statement $9 - 5 = 4$, which number is the subtrahend? Which is the minuend? Which is the difference or remainder?

8. Which term must always be placed before the sign minus?

9. Which term must always precede the word "from" when used to indicate subtraction?

10. In the statement 5 from 9 leaves 4, which number is the subtrahend? Which is the minuend? Which the remainder or difference?

11. Indicate that 25 is to be subtracted from 100, using the sign minus.

12. Indicate that 25 is to be subtracted from 100, using the sign of subtraction.

13. Indicate that 25 is to be subtracted from 100, using the word "from."

14. Indicate that 25 is to be subtracted from 100, using the word "minus."

15. Indicate that — is to be subtracted from —, by means of the sign of subtraction.

16. Indicate that — is to be subtracted from —, by means of the word "minus."

17. Indicate that — is to be subtracted from —, by means of the word "from."

LESSON VII.

1. Give two rules for proving subtraction, and perform examples illustrating both rules using numbers smaller than 20.

2. In proving by addition that 1870 subtracted from 1884 leaves 14, what numbers are added? what terms are added?

3. If the work is correct, what results from adding the subtrahend and remainder?

4. If the work is incorrect, will the sum of the subtrahend and remainder added together be like or unlike the minuend?

5. If I should tell you that 1870 from 1884 leaves 10, how would you show by addition that my statement was incorrect?

6. Subtract 37 from 100, and test the work by addition.

7. Subtract 360 from 1392, and test by addition. 945 from 1000. 625 from 1801. 11 from 3700.

8. In proving by subtraction that 1870 subtracted from 1884 leaves 14, from what is 14 subtracted?

9. In testing subtraction, from which term is the remainder subtracted?

10. What will the result of subtracting the remainder from the minuend be like, if the work is right?

11. Subtract 12 from 20, and prove by subtraction that the result is 8.

12. Subtract 35 from 50, and test by subtraction. 95 from 117. 27 from 364. 948 from 13256. 462 from 500.

13. Subtract three thousand four hundred and ten from one hundred thousand.

14. Which number in the above is the minuend? Which the subtrahend? What is the remainder?

15. Subtract 368910 from 12913675, and test the work by addition.

16. Subtract 95678 from 321067, and test by subtraction.

17. Add three million six hundred and forty-seven thousand three hundred and twelve to forty-five thousand three hundred and fifty, and test the work by subtraction.

18. Subtract a number consisting of three places from a number consisting of five places, and write against each term the name of that term; thus,

$$\begin{array}{rl} 125 & \text{minuend} \\ \underline{47} & \text{subtrahend} \\ 78 & \text{remainder.} \end{array}$$

19. Perform all the examples in your Common School Arithmetic under Subtraction.

LESSON VIII.

1. Write a number containing 8 figures, and point it off into periods.

2. Write the same number in figures, writing the name of each period after the figures of that period.

3. Write the same number in words.

4. Write in figures 1 billion 10 million 500 thousand and 1.

5. Write in words 3006900310.010.

6. Write in figures 100 quadrillion 10 thousand 375.

7. Write after the figures of each period the name of that period in the following:

3679400.
36984.
300067.
97654003210.
120679854003.
10000001.

8. What is the name of the fifth period? of the first period? of the seventh period? of the second period? of the third period? of the sixth period? of the fourth period? of the eighth period? of the ninth period? of the tenth period?

9. Make thirty ciphers, point them off into periods of three ciphers each, and above each period write the name of that period.

10. Write in figures one trillion one billion one million one thousand one hundred and one.

11. What is the name of the first place on the right? of the second place? of the third place? of the fourth place? of the tenth place? of the sixth place? of the ninth place? of the fifth place?

12. Figures in different places are units of different orders. The first place on the right is units of the first order; the second place, or tens, is units of the second order; the third place, or hundreds, is units of the third order; and so on.

13. Of what order are units in the tenth place?

14. What would 5 units of the tenth order be called? 5 units of the ninth order? 5 units of the seventh order? 5 units of the eighth order?

15. Ten units of any order are equal in value to one unit of the next higher order; and one unit of any order is equal in value to ten units of the next lower order.

16. How many tens equal one hundred? five hundreds? six hundreds? nine hundreds? seven hundreds?

17. How many hundred thousands equal one million?

18. In the number 444 which 4 is greatest? How many times greater is 4 hundreds than 4 tens? How many times greater is 4 tens than 4 units?

LESSON IX.

1. What do we call the process of repeating one number as many times as there are units in another number?

2. What is the process of finding the sum of two or more numbers?

3. What is the process of finding the difference between two numbers?

4. What is multiplication?

5. The terms in multiplication are the multiplicand and the multiplier.

6. The result is called the "product."

7. What is the result called in addition? in subtraction? in multiplication? in division?

8. In the statement "10 times 20 are 200," which number is the multiplicand? which is the multiplier? which is the product?

9. In the statement "$10 \times 20 = 200$," which number is the multiplicand?

10. Which term is placed before "times"?

11. When the sign is used to indicate multiplication, which term precedes it?

12. Is the result changed by changing the order of the terms in multiplication?

13. In the statement "$25 \times 8 = 200$," which is the multiplicand? Are 25 times 8 and 8 times 25 the same?

14. Express 7 times 365 by means of the sign of multiplication.

15. The terms, *i.e.* the multiplicand and multiplier, are called "factors" of the product. Which are the factors in the following: 4 times 16 are 64? 25 times 25 are 625? 4 times 50 are 200? 5 × 15 = 75?

16. Give the products in the above.

17. Multiply a number containing three figures by 8.

18. What is the multiplicand in the example you have just performed?

19. What is the product? What is the multiplier?

20. Give the factors.

21. Which is largest, the multiplicand, the multiplier, or the product?

22. Which is larger, the multiplicand or the multiplier? *Answer.* Neither is necessarily larger than the other.

23. Give two rules for proving or testing multiplication.

24. What is the result of multiplying 16 by 3? 3 will go in 48 how many times? 16 will go in 48 how many times?

25. The product divided by the multiplicand gives what?

26. The product divided by the multiplier gives what?

27. Perform all the examples under multiplication in your Common School Arithmetic.

LESSON X.

1. What do we call the process of dividing one number into as many equal parts as there are units in another number?

2. What is addition? subtraction? multiplication? division?

3. What are the terms in division?

4. Which is largest, the dividend, the divisor, or the quotient? the multiplicand, the multiplier, or the product?

5. In the statement "300 ÷ 15 = 20," which number is the divisor? Which number is the dividend? Which is the quotient? Which term is placed before the sign?

6. When the word "in" is used to indicate division, which term is placed before and which after "in"?

7. Give two rules for testing or proving division.

8. Divide 365 by 15, and prove it by division.

9. Divide 46840 by 25, and prove it by multiplication.

10. Divide 3648978 by 43, and test it by multiplication.

11. Test the following:

1000 ÷ 5 = 200.
80 ÷ 16 = 5.
150 ÷ 2 = 75.
4 × 16 = 64.
100 ÷ 25 = 4.
75 + 75 = 150.

50 from 175 leaves 50.
200 − 175 = 25.
15 × 5 = 75.
20 − 20 = 0.
12 ÷ 12 = 1.
19 and 19 are 38.

12. When the sign minus is used to indicate subtraction, can the relative position of the terms be changed?

13. Can the relative position of the terms in subtraction ever be changed? in division? in multiplication?

14. Is the result changed by changing the order of numbers added?

15. Add 4, 9, 6, 5, 10, and 11.

16. Change the order, and see if the result is the same.

17. Perform all the examples in your Common School Arithmetic under Division.

18. Divide 4 million 375 thousand 821 by 27, and test the work by multiplication.

19. If a number is left after dividing, what is it called, and where is it placed?

LESSON XI.

1. How is the value of a number changed by adding a cipher to its right?

2. If a cipher is added to 7, what does it become?

3. How many times greater is 70 than 7?

4. By what is a number multiplied when a cipher is added to its right?

5. By what is a number multiplied by adding 2 ciphers to its right? by adding 3 ciphers? by adding 5 ciphers? by adding 4 ciphers? by adding 9 ciphers? by adding 7 ciphers? by adding 6 ciphers?

6. Multiply 392 by 10; by 1000; by 10000; by 100; by 100000.

7. Add two ciphers to 45, and write the result in words.

8. Add 4 ciphers to 16, and write the result in words.

9. Is the value of a number increased or diminished by cutting off one place from the right?

10. How many times less is 15 than 150?

11. Removing the cipher from 150 divides it by what number?

12. By what is a number divided when one place is cut off from the right?

13. Divide 340 by 10; 1000 by 10; 1630 by 10; 940 by 10.

14. How many places must be cut off in order to divide a number by 10? by 100? by 1000? by 100000?

15. Divide 364000 by 10; by 100; by 1000.

16. $346 \div 10 =$ how many?

Answer. $346 \div 10 = 34\frac{6}{10}$.

17. $59680 \div 100 =$ how many?

Answer. $59680 \div 100 = 596\frac{80}{100}$.

18. $8006 \div 100 =$ how many?

Answer. $8006 \div 100 = 80\frac{6}{100}$.

19. $180001 \div 1000 =$ how many?

Answer. $180001 \div 1000 = 180\frac{1}{1000}$.

20. Divide:

4960 by 100.
36400 by 10.
954210 by 1000.
56003 by 1000.
86492 by 100.
48000 by 100.
86000 by 10.
493076 by 1000.
485600 by 100.

21. Multiply 467 by 10; by 100; by 100000; by 10000.

22. Divide:

36 by 1000.
147 by 100.
147 by 1000.
40067 by 10000.
8690 by 10.
463842101 by 100.

23. Divide 3640 by 20; by 200; by 2000.

24. Multiply 467 by 200; by 20; by 100; by 10.

25. 4970 ÷ 200 = how many?
86005 ÷ 2000 = how many?
100790 ÷ 30 = how many?
90506 ÷ 3000 = how many?

LESSON XII.

1. Of what is division the reverse?

2. Of what is addition the reverse?

3. Of what is multiplication the reverse?

4. Of what is subtraction the reverse?

5. What is a sign?

6. Of what is the St. Andrew's Cross the sign? Make it. Describe it.

7. Of what is minus the sign? Make it. Describe it.

8. Of what is plus the sign? Make it. Describe it.

9. What is the art of reading numbers called?

10. What is the science of numbers and the art of computing by them?

11. Of what is the St. George's Cross the sign? Describe it.

12. Describe the sign of equality. Of division.

13. Do you count from right to left or from left to right to find the order of any given place in a number?

14. What is the name of the third period?

15. How many times larger is a figure in hundreds of thousands' place than the same figure in tens of thousands' place?

16. How many times more is 500000 than 50000?

17. Write in Roman capitals 1000; 67; 189; 1474.

18. What is a unit?

19. What is a number?

20. What do we call a direction for performing an operation?

21. What is a rule?

22. Give a rule for testing subtraction.

23. How many units of any order make 1 unit of the next higher order? Illustrate.

24. 1 unit of any order makes how many units of the next lower order? Illustrate.

25. Write in figures a number of 13 places, 5 of which shall be ciphers, and then write the number in words.

26. Write the same number again, writing the name of each period after the figures of that period.

27. Write in words 10 billion 4 million 11 thousand and 19.

LESSON XIII.

1. Give the factors of 15. *Answer.* 3 and 5 are factors of 15.

2. Give factors of 21; of 35; of 49.

3. Divide 36478 by 12 by short division.

4. Divide 36478 by 12 by long division.

5. When is long division used and when short division?

6. Should you use long division or short division in dividing 36478 by 12?

7. Perform an example requiring long division.

8. What is long division? short division? Which is the process of dividing one number by another mentally without writing out the work?

9. Is long division used in dividing 36400 by 100?

10. Divide a number of ten figures by 11 by short division.

11. When one number is divided by another and the work is not written out, what is the process called?

12. If the work is written out, what do we call the process?

13. Name the four Fundamental Processes which you have learned.

14. Can any calculation beyond counting be made with numbers without the use of one of these fundamental processes?

15. Perform and test an example in division which has a remainder.

16. Give a rule for testing subtraction.

17. Divide 364896 by 1000.

18. Multiply 73649125 by 12.

19. Write the multiplication table in a square as far as "11 times 11."

20. Write the odd numbers from 30 to 50.

21. Give a rule for dividing a number by 1 with a given number of ciphers.

22. Write the even numbers from 20 to 40.

23. Add six numbers of six places each.

24. Subtract 9999 from 10000.

25. Multiply a number containing 10 figures, no one of which shall be less than 5, by 789.

LESSON XIV.

1. Multiplying the divisor by the quotient gives what term?

2. What is found by dividing the dividend by the divisor?

3. What is found when the dividend is divided by the quotient?

4. What do we get by adding the subtrahend and the remainder?

5. What is found when the remainder is subtracted from the minuend?

6. What is found by dividing the product by the multiplier?

7. What is found by dividing the product by the multiplicand?

8. What is produced when the multiplicand is multiplied by the multiplier? the multiplier by the multiplicand?

9. What is the name of the answer in division? in addition? in subtraction? in multiplication?

10. Write four names for the term 100 in the statement "50 + 50 = 100."

11. Add three million seven hundred and ten

thousand to eight thousand five hundred and twenty-seven.

12. Subtract a number containing six figures from 1000000.

13. Multiply 3648 by 1000. 4986 by 1001. 6875 by 2200.

14. Divide 368497625 by 100; thus,

$$368497625 \div 100 = 3684976\tfrac{25}{100}.$$

15. How many figures did you cut off in the above example?

16. Give a rule for dividing a number by 1 with a number of ciphers annexed.

17. Write in words 368497625.

18. Multiply 39876 by 689, and test the work by division.

19. Divide 58964 by 92, and prove the work by multiplication.

20. Add five numbers of six figures each.

LESSON XV.

1. When two or more numbers are multiplied together they are factors of the number produced.

2. 4 and 5 are factors of 20.

3. Of what number are 2 and 11 the factors?

3 and 6?
9 and 3?
8 and 4?
7 and 5?
6 and 7?
9 and 8?
8 and 7?
15 and 3?
12 and 11?
3 and 25?
5 and 50?
15 and 4?

4. Are the multiplier and multiplicand factors of the product?

5. If 6 is one factor and 72 is the product, what is the other factor?

6. If 12 is one factor and 144 is the product, what is the other factor?

7. If 400 is the product and 20 is one factor, what is the other factor?

8. When the product and one factor are given, how is the other factor found?

9. How is the product found when both factors are given?

10. What is the product of 9 and 8?

11. How is the product found when the multiplier and multiplicand are given?

12. How is the multiplicand found when the multiplier and the product are given?

13. How is the multiplier found when the multiplicand and the product are given?

14. What are the factors of a number?

15. Can a number have more than two factors?

16. What is the product of 2, 3, and 5?

17. The product of 2, 3, and 5 being 30, give three factors of 30.

18. The product of 2, 5, 7, and 3 is 210. What factors were used to produce 210?

19. Give the factors of 15; of 18; of 35; of 49; of 27; of 21; of 12; of 30; of 36; of 40; of 100.

20. What is the product of the factors 361 and 23?

21. What is the product of the factors 27, 32, 9, and 12?

LESSON XVI.

1. A prime number is a number which cannot be divided without a remainder by any number except itself and unity.

2. A composite number is a number which is produced by multiplying two or more numbers together, or which can be divided by two or more numbers.

3. Can 2 be divided by any number except itself and 1?

4. Is 2 prime or composite?

5. Can 3 be divided by any number except itself and 1?

6. Is 3 prime or composite?

7. Can 4 be divided by any number except itself and 1?

8. Is 4 prime or composite?

9. Can 5 be divided by any number except itself and 1?

10. Is 5 prime or composite? 6? 7? 8? 9? 10? 11? 12? 13? 14? 15?

11. Write the prime numbers from 1 to 20.

12. Write the composite numbers from 1 to 20.

13. What is an even number? an odd number?

14. Write the even numbers from 1 to 20; the odd numbers from 1 to 20.

15. How many prime numbers are there between 10 and 20?

16. How many composite numbers are there from 1 to 29?

17. Give five even numbers; five odd numbers; five prime numbers; five composite numbers.

18. Multiply 47 by 25:

$$\begin{array}{r} 47 \\ 25 \\ \hline 235 \\ 94 \\ \hline 1175 \end{array}$$

19. Multiply 47 by 5, and that result by 5: $47 \times 5 = 235 \times 5 = 1175$.

20. The result of multiplying by a composite number is the same as the result of multiplying first by one factor and that result by another factor, and so on, till all the factors are used as multipliers.

21. Multiply 83 by 24.

22. Multiply 83 by the factors of 24, 6 and 4.

23. Multiply 83 by the factors of 24, 2, 2, 2, and 3.

24. Multiply 83 by the factors of 24, 3 and 8; by the factors 2 and 12.

LESSON XVII.

1. Multiply 73 by 11.

2. Is 11 a prime number or a composite number?

3. Has 11 factors?

4. Multiply 25 by 19.

5. Has 19 factors?

6. Can you multiply 27 by 16 mentally or without use of pen or pencil?

7. Multiply 37 by the factors of 16, 2, 2, 2, and 2, without writing out the work, and give the result.

8. Multiply 19 by 12, using the factors, without writing out the work.

9. Multiply 43 by 24, using the factors 3, 2, 2, and 2, mentally, and give the result: $43 \times 24 = 1032$.

10. 8 and 3 are factors of 24; 4 and 6 are factors of 24; 2 and 12 are factors of 24; and 2, 2, 2, and 3 are factors of 24. Which are the prime factors of 24? *Answer.* 2, 2, 2, and 3 are the prime factors of 24.

11. Give the prime factors of 12.

12. Give the prime factors of 30; of 32; of 36; of 20.

13. Give all the pairs of factors and the prime factors which produce 60.

$2 \times 30 = 60.$ $4 \times 15 = 60.$ $6 \times 10 = 60.$
$3 \times 20 = 60.$ $5 \times 12 = 60.$ $2 \times 2 \times 3 \times 5 = 60.$

14. Give all the pairs of factors and the prime factors which produce 18; thus:

$$\begin{array}{l} 2 \times 9 \\ 3 \times 6 \\ 3 \times 3 \times 2 \end{array}$$

15. Give in the same way the factors which produce 12; 16; 24; 72; 81; 96; 100.

* * *

LESSON XVIII.

1. Divide 1500 by 25.

$$\begin{array}{r} 25)1500(60 \\ \underline{150} \\ 0 \end{array}$$

2. Divide 1500 by 25, dividing first by one factor and that result by the other factor; thus, 1500 ÷ 5 = 300. 300 ÷ 5 = 60.

3. Is the result the same by both processes?

4. Divide 288 by 16.

5. Divide 288 by 16, using the factors of 16 as above.

6. Divide 342 by 18, using the prime factors of 18.

7. Divide 216 by 24, using the prime factors of 24.

8. Divide 288 by 36, using the prime factors of 36.

9. Multiply 112 by 36, using its prime factors.

10. Give all the pairs of factors and the prime factors of 30; of 42; of 49.

11. Write the multiplication table as far as "12 times 12" in a square.

12. Write the table by which starch is weighed.

13. Draw the face of a watch with the hands at a quarter past seven.

14. Is there anything on the face of a clock or watch to indicate whether it is seven in the morning or seven in the evening?

15. It is thought that it would be better to change the manner of expressing time, and that instead of twelve hours there should be twenty-four hours indicated on all time-pieces, and that the hours should be named as far as twenty-four so that at midnight it would be 24 o'clock.

16. Draw a dial with twenty-four hours indicated. Did you ever hear of a time-piece made to indicate twenty-four hours?

17. Ask your teacher if there are such time-pieces, and write his answer.

LESSON XIX.

1. What is a prime number?

2. What is a composite number?

3. What are the factors of a number?

4. What are the prime factors of a number?

5. What is a divisor of a number?

6. What is a multiple of a number?

7. What is a common divisor of two or more numbers? *Answer.* A common divisor of two or more numbers is a number which will divide them each without a remainder.

8. Give a common divisor of 4, 6, 8, and 10.

9. Give a common divisor of 10, 15, 20, and 25.

10. Give a common divisor of 3, 6, 9, and 15.

11. Give a common divisor of 5, 30, 100, and 1000.

12. Give a common divisor of 12, 15, 45, and 60.

13. What is the greatest common divisor of two or more numbers? *Answer.* The greatest common divisor of two or more numbers is the greatest divisor which will divide all of the numbers without a remainder.

14. What is the greatest common divisor of 6, 8, 10, and 12?

15. The numbers 12, 16, and 20 have 4 as a common divisor, and also 2 as a common divisor. What is the *greatest* common divisor of 12, 16, and 20?

16. What common divisors have 15, 30, and 60? *Answer.* 15, 30, and 60 have 3, 5, and 15 as common divisors.

17. What is the greatest common divisor of 15, 30, and 60?

18. All the above common divisors you have been able to detect at sight, but with large numbers this is impossible.

19. Can you tell at sight the greatest common divisor of 10, 15, and 20? of 8, 16, 20, and 24? of 6, 12, 16, and 18?

20. Can you tell at sight the greatest common divisor of 126 and 72?

21. To get the greatest common divisor of two numbers, divide the greater number by the less, and if there is a remainder, divide the number used as a divisor by that remainder, and so on till there is no remainder. The last divisor will be the greatest common divisor.

```
72)126(1
    72
    --
    54)72(1
       54
       --
       18)54(3
          54
          --
```

18 is the greatest common divisor of 126 and 72.

22. If you were asked for the greatest common divisor of 126, 72, and 27, you would first find the greatest common divisor of 126 and 72 as above, and then the greatest common divisor of 18 and 27.

```
18)27(1
   18
   --
    9)18(2
      18
      --
```

9 is the greatest common divisor of 126, 72, and 27.

23. Find the greatest common divisor of 308 and 176; of 340 and 187.

24. Find the greatest common divisor of 45 and 375.

25. Another method of finding the greatest common divisor of several numbers is by resolving the numbers into their prime factors. The product of all the factors common to the several numbers will be the greatest common divisor.

26. To find the greatest common divisor of 24, 84 and 132, first resolve the numbers into their prime factors.

$$\begin{array}{rl} 24 = & 2 \times 2 \times 2 \times 3. \\ 84 = & 2 \times 2 \times 3 \times 7. \\ 132 = & 2 \times 2 \times 3 \times 11. \end{array}$$

The common factors are 2, 2, and 3. Multiply these factors together and the product 12 is the greatest common divisor of 24, 84, and 132.

27. By the method just explained find the greatest common divisor of 18, 27, 45, 108, and 180.

28. Find the greatest common divisor of 21, 28, 63, 84, and 420.

29. Find the greatest common divisor of 25, 75, and 125.

30. Can you tell at sight the greatest common divisor of 25, 75, and 125? of 50, 150, 200, and 300? of 19 and 29?

31. Give four numbers of which 10 is the greatest common divisor.

32. Give two numbers of which 16 is the greatest common divisor.

33. Give five numbers of which 5 is the greatest common divisor.

34. Give three numbers of which 9 is the greatest common divisor.

35. Give six numbers of which 3 is the greatest common divisor.

36. Give two numbers of which 21 is the greatest common divisor.

37. Give eight numbers of which 2 is the greatest common divisor.

38. Give four numbers of which 4 is the greatest common divisor.

39. Give five numbers of which 11 is the greatest common divisor.

40. Give eight numbers having no common divisor.

LESSON XX.

1. A multiple of a number is a number that can be divided by that number without a remainder: 6 is a multiple of 3; 8 is a multiple of 4; 15 is a multiple of 3.

2. What is a common multiple of two or more numbers? *Answer.* A common multiple of two or more numbers is a number that can be divided by each of them without a remainder: 12 is a common multiple of 2, 3, and 4.

3. What is the least common multiple of two or more numbers? *Answer.* The least common multiple of two or more numbers is the smallest number that can be divided by each of them without a remainder.

4. What is the least common multiple of 2 and 3? of 3 and 4? of 4 and 5? of 4 and 6? of 2, 4, and 6? of 2, 4, 5, and 6?

5. What is the least common multiple of 3, 4, 6, 9, 18, and 36?

6. Give at sight the least common multiple of 2, 4, 5, 8, 10, and 20.

7. When you cannot give at sight the least common multiple of several numbers, arrange them in a line, and divide by prime factors in the following manner:—

Find the least common multiple of 2, 4, 8, 22, and 24. Multiplying together 2, 2, 2, 11, and 3, we get 264, which is the least common multiple of 2, 4, 8, 22, and 24.

2	2	4	8	22	24
2	1	2	4	11	12
2	1	1	2	11	6
	1	1	1	11	3

8. Find the least common multiple of 9, 8, 12, 18, 24, 36, and 72; of 10, 12, 16, 24, 48; of 3, 6, 8, 9, 10; of 25, 50, and 75; of 12, 20, 30, and 40.

9. Give four numbers of which 12 is the least common multiple.

10. Of what seven numbers is 36 the least common multiple?

11. Give six numbers of which 24 is the least common multiple.

12. Give three numbers of which 16 is the least common multiple.

LESSON XXI.

1. What is the latitude of Quito, the capital of Ecuador?

2. What is the latitude of Cape Horn?

3. How many degrees is Cape Horn from the South Pole? from the North Pole? from the Equator?

4. In what latitude is the Cape of Good Hope?

5. What is latitude?

6. What is longitude?

7. Write the above definitions from your geography, if you do not know them.

8. What is the name of the line from which latitude is reckoned?

9. Does the line go all the way around the earth?

10. Does the line from which longitude is reckoned go all the way around the earth?

11. Where does it terminate?

12. How many degrees from one pole to the other?

13. How many degrees in one-half of any circle?

14. How many degrees from any meridian around the earth to that same meridian?

15. How many degrees from any meridian to the meridian directly opposite?

16. How many degrees in a semicircle?

17. How many degrees of latitude are there? *Answer.* There are 90 degrees of latitude.

18. How many degrees of longitude are there? *Answer.* There are 180 degrees of longitude.

19. Why is the meridian passing through Green-

wich, England, the meridian chosen as the one from which longitude is reckoned?

20. Where is latitude marked on maps?

21. Where is longitude marked on maps?

22. Find a map of England, and see if Greenwich is on the meridian marked with a cipher.

23. Find some other town which has no longitude, that is, which is neither east nor west from the meridian of Greenwich.

24. Take your school-room globe, and tell how many degrees you could go west from the meridian of Greenwich before you would be in east longitude.

25. How many degrees could you go east before you would be in west longitude?

26. Take an apple and cut a place upon it to represent Greenwich; trace a line which shall indicate the meridian of Greenwich, and then indicate an island on the equator, 100° east of Greenwich.

27. Give the longitude and latitude of the Sandwich Islands.

28. Of Washington, the capital of the United States; of London; of Behring Strait; of San Francisco; of Calcutta; of Melbourne, Australia; of Cairo, Egypt.

29. How many degrees of latitude are there?

30. How many degrees of longitude are there?

31. Is latitude reckoned from a circle or from a semicircle of the earth?

32. Is longitude reckoned from a circle or from a semicircle of the earth?

33. The city of Mexico is in 19° north latitude.

Santiago is in 34° south latitude. How many degrees farther south is Santiago than Mexico?

34. The Island of Terra del Fuego is in 55° south latitude.

35. The Island of Juan Fernandez is in 34° south latitude. How many degrees farther south is Terra del Fuego than Juan Fernandez?

36. Juan Fernandez is in 79° west longitude. Terra del Fuego is in 70° west longitude. How many degrees farther west is Juan Fernandez than Terra del Fuego?

37. In what longitude and latitude is Reykjavik, the capital of Iceland?

38. How many degrees farther west is Reykjavik than St. Petersburg, the capital of Russia?

39. How many degrees east of Genoa, Italy, is Sevastopol, Russia?

40. How many degrees farther east is Greenwich than Washington, the capital of the United States?

41. Longitude is sometimes reckoned from the meridian of Washington.

42. How many miles in a degree of latitude?

43. Are all degrees of latitude of the same length?

44. Where are degrees of longitude 69⅛ miles in length?

45. Are degrees of longitude greater at the Tropic of Cancer or at the Arctic Circle?

46. Where are degrees of longitude the greatest?

47. How many degrees of latitude from 12° N. L. to 12° S. L.?

48. How many degrees from 12° N. L. to 20° N. L.?

49. How many degrees of longitude from 15° E. L. to 36° E. L.?

50. How many degrees of longitude from 25° W. L. to 25° E. L.?

51. How many miles in ten degrees of latitude?

52. How many miles in ten degrees of longitude on the Equator?

LESSON XXII.

1. By what is a number multiplied by annexing two ciphers to its right? Illustrate.

2. Multiply some number by 1000.

3. Divide 64000 by 100.

4. Multiply a number containing six places by 24, using any two of the factors of 24.

5. Divide 164725 by the prime factors of 20.

6. Multiply 1367 by 200 mentally; by 2000; by 20000.

7. Is a number increased or diminished when it is divided? when it is multiplied? when it is doubled? when a cipher is annexed to its right? when a figure is cut off from its right?

8. If you wish to write 3 hundreds and 3 units, how do you express the absence of tens?

9. Can units of different orders be added?

10. How many sides has a square? Draw a square.

11. How many sides has a cube?

12. Can the drawing of a cube be made to show more than three of its sides?

13. Any figure bounded by three straight lines is a triangle. Draw a triangle.

14. Draw a circle. A semicircle.

15. What is the art of naming numbers called?

16. What is the art of writing or representing numbers?

17. Make the character called "plus"; the character called "minus"; the character called "zero"; the character used to indicate U. S. money; to indicate a pound sterling; to indicate degrees.

LESSON XXIII.

1. There are several different scales for registering temperature by means of the thermometer. Only one is in common use in this country. Our school-room thermometer, Fahrenheit's, has the freezing-point of water marked at 32° above zero.

2. Look at the thermometer, and tell how many degrees above freezing-point the mercury now stands.

3. If the mercury stands at 70°, how many degrees must it fall to reach freezing-point?

4. How many degrees above zero is boiling-point? is freezing-point? is blood heat?

5. When the mercury stands at 10° below zero, how many degrees colder is it than when it stands at 35° above zero?

6. Draw a picture of a thermometer.

7. Describe a thermometer.

8. Describe a clock.

9. Draw a clock.

10. Draw the picture of a cord of wood, and write the figures indicating its length, height, and the length of the wood.

11. Describe the sign of addition.
12. Describe the sign of subtraction.
13. Describe the sign of multiplication.
14. Describe the sign of division.
15. Describe the sign of equality.
16. Draw two parallel horizontal lines.
17. Draw two parallel perpendicular lines.
18. Draw two parallel vertical lines.

LESSON XXIV.

1. Common factors of the divisor and dividend may be suppressed without altering the quotient.

2. Dividing 198 by 22 we get 9.

3. 2 is a factor of 198, and is also a factor of 22; hence, suppressing 2 as a factor in both numbers, we have 99 and 11, and 99 divided by 11 equals 9.

4. Divide 84 by 14.

5. Have 84 and 14 a common factor? Suppressing the common factor 2 and dividing 42 by 7, how does the result compare with the result from dividing 84 by 14? Illustrate.

6. Suppress the common factor in 105 and 21, and show that the result is the same as from dividing 105 by 21.

7. Divide 32 by 4, and then divide one-half of 32 by one-half of 4, and compare the results.

8. Divide 90 by 15, and then divide one-fifth of 90 by one-fifth of 15, and compare the results.

9. Which is greater, 200 divided by 20 or one-half of 200 divided by one-half of 20?

10. Which is greater, 75 divided by 25 or one-fifth of 75 divided by one-fifth of 25?

11. Which is greatest, 144 divided by 12, one-half of 144 divided by one-half of 12, one-third of 144 divided by one-third of 12, one-fourth of 144 divided by one-fourth of 12, or one-sixth of 144 divided by one-sixth of 12? Illustrate $144 \div 12 = 12$.

one-half of 144 is 72.
one-half of 12 is 6. $72 \div 6 = 12$.

one-third of 144 is 48.
one-third of 12 is 4. $48 \div 4 = 12$.

one-fourth of 144 is 36.
one-fourth of 12 is 3. $36 \div 3 = 12$.

one-sixth of 144 is 24.
one-sixth of 12 is 2. $24 \div 2 = 12$.

LESSON XXV.

1. Multiply 25 by 4, and divide the result by 4. $25 \times 4 = 100$. $100 \div 4 = 25$.

2. Multiplying a given number by any other number and dividing the result by the same number produces the number given.

3. Multiply 16 by 4, and divide the result by 4.

4. Dividing a given number by any other number and multiplying that result by the same number produces the number given.

5. Divide 80 by 4, and multiply that result by 4. $80 \div 4 = 20 \times 4 = 80$.

6. Illustrate with the given numbers: 100; 25; 50; 40; 90. Factors may be used instead of the numbers.

7. Multiply 10 by 6, and divide the result by the factors of 6, 2, and 3. $10 \times 6 = 60$. $60 \div 2 = 30$. $30 \div 3 = 10$.

8. Divide 200 by 4, and multiply the result by the factors of 4.

9. Two numbers written, one above and the other below a horizontal line, indicate that the number above the line is to be divided by the number below the line.

10. $\frac{400}{2}$ indicates that 400 is to be divided by 2.

11. If it becomes necessary to multiply a number by some other number and then divide the result by the number used as a multiplier, we know that the final result will be the original number; hence we do not need to do the work.

12. If I should tell you that Mrs. Brown bought 25 yards of silk at 3 dollars a yard, to make dresses for her three daughters, and should ask you what the silk for each dress cost, you would multiply 3 dollars by 25, getting 75 dollars, and divide that by 3, getting 25 dollars. Now the result of multiplying 25 by 3 and 3 by 25 is the same, and as 25 is to be multiplied and that result divided by 3, we know, without performing the work, that the final result will be 25. We should indicate the work by writing the numbers which are to be multiplied and used as a

dividend above a line, and the divisor, or numbers to be multiplied for the divisor below the line, thus:

$$\frac{25 \times 3}{3} = 25.$$

13. This is called "cancellation."

14. Cancel the factors common to both dividend and divisor, and divide the following:

$$\frac{75 \times 2 \times 3 \times 4}{2 \times 3 \times 4 \times 5}. \qquad \frac{75 \times \cancel{2} \times \cancel{3} \times \cancel{4}}{\cancel{2} \times \cancel{3} \times \cancel{4} \times 5} = 15.$$

15. Work out the above in full, thus:

$75 \times 2 = 150.$ $150 \times 3 = 450.$ $450 \times 4 = 1800.$
$2 \times 3 = 6.$ $6 \times 4 = 24.$ $24 \times 5 = 120.$
$1800 \div 120 = 15.$

16. Divide the product of 5, 7, 5, 9, by the product of 5, 5, 9, 7.

17. Divide the product of 20, 3, 8, 4, 7, by the product of 8, 7, 4, 5.

18. Divide the product of 15, 12, 7, 6, 5, by 5, 7, 6, 3, 4.

$$\frac{\overset{5}{\cancel{15}} \times \overset{3}{\cancel{12}} \times \cancel{7} \times \cancel{6} \times \cancel{5}}{\cancel{5} \times \cancel{7} \times \cancel{6} \times \cancel{3} \times \cancel{4}} = 15.$$

19. Divide the product of 8, 4, 9, 2, 12, 20, by the product of 4, 3, 2, 12, 8.

20. Divide the product of $17 \times 2 \times 6 \times 7 \times 3 \times 5$ by the product of $2 \times 6 \times 5 \times 3 \times 11$.

21. Perform all the examples in your Common School Arithmetic under Cancellation.

LESSON XXVI.

1. Multiply 67 by 25.

2. How many times greater is 100 than 25?

3. Multiply 67 by 100.

4. How many times greater is the result of multiplying 67 by 100 than of multiplying 67 by 25?

5. Now if you divide the product of 100 times 67 by 4, you will obtain the same result as from multiplying 67 by 25.

6. Which is easier, to multiply 67 by 25 or to multiply 67 by 100 and divide by 4?

7. Because it is easier and the result is the same, when you have to multiply a number by 25, it is better to annex two ciphers to the number and divide by 4 than to multiply by 25.

8. Perform three examples in which numbers larger than 300 are multiplied by 25.

9. 50 is $\frac{1}{2}$ of 100.
$33\frac{1}{3}$ is $\frac{1}{3}$ of 100.
25 is $\frac{1}{4}$ of 100.
20 is $\frac{1}{5}$ of 100.
$16\frac{2}{3}$ is $\frac{1}{6}$ of 100.
$12\frac{1}{2}$ is $\frac{1}{8}$ of 100.
125 is $\frac{1}{8}$ of 1000.

10. To multiply a number by 50, annex two ciphers and divide by 2.

11. To multiply a number by $33\frac{1}{3}$, annex two ciphers and divide by 3.

12. To multiply a number by 25, annex two ciphers and divide by 4. And so on.

13. Multiply 85 by $33\frac{1}{3}$.

14. Multiply 46 by 25.

15. Multiply 106 by 20. It is easier to multiply by 20 than to multiply by 100 and divide by 5.

16. Multiply 48 by $16\frac{2}{3}$.

17. Multiply 96 by $12\frac{1}{2}$.

18. Multiply 847 by 125.

19. Divide 640 by 10; by 100; by 1000.

20. Divide 3000 by 25.

21. Divide 3000 by 100, and multiply the result by 4.

22. How does the result of dividing 3000 by 25 compare with the result of dividing 3000 by 100 and multiplying by 4?

23. Divide 34700 by 25.

24. Divide 867500 by 25.

25. Divide 21050 by 25.

26. Divide 22600 by $33\frac{1}{3}$.

27. Divide 16400 by $33\frac{1}{3}$.

28. Divide 4050 by $12\frac{1}{2}$.

29. Divide 77200 by $16\frac{2}{3}$.

30. Perform all the examples in your Common School Arithmetic under Contractions in Multiplication and Division.

LESSON XXVII.

1. Write the table for United States Money.

2. Write the table for English Money.

3. Where are the hands of the clock at ten minutes past 12?

4. Write the table for Time Measure.

5. How many degrees from the North Pole is a lake in British Columbia situated in 50° north latitude?

6. How many degrees from the South Pole is the above lake?

7. If the above lake is in 120° west longitude, how many degrees is it west of Newfoundland?

8. Write the table for Circular Measure.

9. How would you multiply 32 by 25 mentally? Write the result.

10. Write a number containing ten places in figures and in words.

11. Give an odd number; an even number; a prime number; a composite number; a fractional number; an integral number.

12. Write the present year in Roman characters.

13. How many years ago was B.C. 450?

14. Write the names of the first eight periods of figures.

15. Are periods counted from the right or from the left?

16. Is the decimal point which is used in pointing off United States money a period or a comma?

17. Which of the coins of the United States are made of silver? which of nickel? which of gold?

18. Is there a coin of the value of one mill?

19. Subtract one dollar sixty-two cents and five mills from thirty dollars.

20. What part of a cent is five mills?

21. What part of a dollar is ten cents?

22. What part of a dollar is twenty-five cents?

23. What part of an eagle is a five-dollar gold-piece?

24. What part of a dollar is fifty cents?

25. What part of a half-dollar is a ten-cent piece?

26. What part of a half-dollar is a five-cent piece?

27. What part of a quarter of a dollar is a five-cent piece?

28. What part of a week is a day?

29. Which is most, half a bushel, two pecks, or sixteen quarts?

30. Write the table for Dry Measure.

31. If the peanut-man sells 16 quarts of peanuts a day at $.05 a quart, how many weeks will it take him to sell $40.00 worth of peanuts? How many bushels must he sell?

◆

LESSON XXVIII.

1. How many units in a dozen? in a score? in a gross? in a dozen? in half a dozen?

2. If half a dozen oranges cost $.20, what will six dozen oranges cost?

3. If 2 penknives cost $1.20, what will they cost a dozen? How much will one gross cost? How much will one knife cost?

4. What will a cord of wood cost at one dollar a cord foot?

5. Write the table for Cubic Measure.

6. Draw a cord of wood.

7. Does the end of a cord of wood form a square?

8. Does the side of a cord of wood form a square?

9. Draw a horizontal line. Draw a perpendicular line from one end of the horizontal line. The angle formed by the meeting of these two lines is a right angle.

10. What is the name of a figure bounded by four straight lines, the corners of which are right angles, but which is not square?

11. Draw a rectangle.

12. Draw a parallelogram.

13. Are the opposite sides of a parallelogram parallel?

14. Draw a square.

15. Are the angles at the corner of a square right angles?

16. An angle smaller than a right angle is an acute angle.

17. An angle larger than a right angle is an obtuse angle.

18. Draw an acute angle; a right angle; an obtuse angle.

19. What are the angles at the corners of your book?

20. What else can you name which has right angles?

21. Try to think of something which has an acute angle; something which has an obtuse angle.

22. You will find these angles in the Appendix.

23. Draw a triangle; a right-angled triangle.

24. Can you draw a triangle which has two right angles?

25. Draw, if you can, a triangle which has two acute angles.

26. Draw, if you can, a triangle which has two obtuse angles.

27. Draw, if you can, a triangle which has three acute angles.

28. How many angles has a triangle?

29. The vertex of an angle is the point where the lines meet which form the angle.

30. Draw another right-angled triangle, and write the letter "a" at the vertex of the acute angles, and the letter "r" at the vertex of the right angle.

31. Draw three different triangles, and indicate the kind of angles by the letters "r," "a," and "o," at the vertex of the angles.

32. Draw a square, and letter the angles.

33. Draw a figure bounded by five straight lines, and letter the angles.

34. What is the name of a figure bounded by five equal straight lines?

35. Draw, if you can, a figure bounded by only two straight lines.

36. What is the circumference of a circle?

37. What is the diameter of a circle?

38. Draw a circle, and indicate its circumference and diameter.

39. Draw a square, and then draw a straight line from its upper right-hand corner to the corner diagonally opposite.

40. Find the word "diagonal" in your Unabridged Dictionary.

41. At the crossing of two streets, one running north and south, and the other east and west, what corner is diagonally opposite the north-east corner?

42. Draw a figure bounded by four equal lines, two of the diagonally opposite corners of which shall be acute, and two of which shall be obtuse.

43. Find the word "diamond" in your dictionary, and you will probably find such a figure.

44. Did you ever see a window, the panes of which were diamond-shaped?

45. Perform the following mentally.

46. Multiply 36 by $16\frac{2}{3}$. $36 \times 16\frac{2}{3} = 600$.

47. Multiply 48 by $12\frac{1}{2}$.

48. Divide 12000 by 25.

49. Multiply 48 by $33\frac{1}{3}$.

50. Multiply 640 by 25.

51. Divide 21100 by 25.

52. Perform all the Miscellaneous Examples in your Common School Arithmetic after Division.

LESSON XXIX.

1. How many are $(12 - 8 + 4) \times (4 + 3 - 6) \div 4$?

2. How many are $(100 - 50 + 50) \times 10$?

3. Write 5000 in Roman characters.

4. When a letter is placed before another letter of greater value, is its value to be added to, or to be taken from, that of the greater?

5. When I is placed before V, is the value to be added to, or taken from, the value of V?

6. When I is placed after V, is its value of I to be added to the value of V, or taken from it?

7. How many inches long is one side of a table which is two feet square?

8. How many inches around the four sides of the table?

9. How many square feet does the top of the table measure?

10. Draw a square representing the top of the table, and divide it into square feet.

11. Which is greater, 3 square inches, or a 3-inch square? Illustrate with drawings.

12. Which is greater, 2 cubic feet or a 2-foot cube?

13. If an apple and a half cost a cent and a half, how much will a dozen apples cost?

14. What is measured by the perch? by the hand? by the league? by the fathom? by the chain? by degrees? by the hour? by the firkin? by the keg? by the cord? by the ton? by the tun? by the bushel? by the barrel? by the peck? by the quart? by the acre? by the mile?

15. What is numbered by the quire? by pairs? by the dozen? by scores?

16. What is weighed by the pound avoirdupois? by pennyweight? by the carat? by the grain? by the ton?

17. Write from memory the line beginning "Thirty days hath September."

18. Divide a number containing ten figures by 4911.

19. Describe a square; a rectangle; a parallelogram; a triangle; a cube; a circle.

20. Draw a semicircle; a horizontal line; an oblique line; two parallel vertical lines.

LESSON XXX.

1. What is a unit?

2. What is a number?

3. What is arithmetic?

4. What is an odd number?

5. What is an even number? a prime number? a composite number?

6. What are the factors of a number?

7. What does "increase" mean?

8. What does "diminish" mean?

9. By which of the four fundamental processes are numbers increased? By which diminished?

10. What is longitude?

11. What is latitude?

12. What is cancellation?

13. What is a common multiple of two or more numbers?

14. What is a common divisor of two or more numbers?

15. Of what is addition the reverse?

16. Give a composite number and its factors.

17. Give the prime numbers between 30 and 40.

18. Write the multiplication table as far as "9 times 9" in a square.

19. At what degree of heat does water boil?

20. What effect is produced on the quotient if both dividend and divisor are either multiplied or divided by the same number? Illustrate.

SECTION II.—COMMON FRACTIONS.

LESSON I.

1. A fraction is one or more equal parts of a unit.

2. Write a unit in figures.

3. What is the name of one of the parts when a unit is divided into two equal parts? Write one-half in figures.

4. When a unit is divided into nine equal parts what is the name of one of the parts? Write one-ninth in figures.

5. What is the name of one of the parts when a unit is divided into three equal parts? Write one-third in figures.

6. When a unit is divided into five equal parts what is the name of each part? Write one-fifth in figures.

7. What is the name of one of the parts when a unit is divided into four equal parts? Into fifteen equal parts? Into six equal parts? Into ten equal parts? Into one hundred equal parts?

8. How many halves make a unit?

9. How many thirds make a unit? How many tenths? How many fifths? How many twentieths?

10. Write in words $\frac{1}{2}$; $\frac{1}{6}$; $\frac{1}{18}$; $\frac{1}{8}$; $\frac{1}{12}$; $\frac{3}{4}$; $\frac{6}{10}$; $\frac{13}{20}$; $\frac{25}{100}$.

11. The number below the line is the denominator. It shows into how many parts the unit has been divided, and gives the name to the parts. If the unit has been divided into 4 equal parts, *four* gives the name to the parts which are fourths.

12. The number above the line shows how many of the parts are taken.

13. What gives the name to the parts in the fraction $\frac{6}{7}$? in $\frac{9}{10}$? in 8 ? in $\frac{1}{18}$? in $\frac{6}{11}$?

14. In the fraction $\frac{6}{10}$ which is the numerator? Which is the denominator? Which names the parts? Which shows how many parts are taken?

15. The numerator and denominator are called the "terms of the fraction."

16. A proper fraction is less than a unit in value and its numerator is less than its denominator.

17. An improper fraction is one of which the numerator equals or excels the denominator, and is equal in value to 1 or more than 1.

18. A mixed number is a whole number and a fraction considered together.

19. You can easily illustrate fractions with apples. Cut an apple into two equal parts. What is one of those parts called? How many halves did the apple make?

20. Cut another apple into three equal parts. What is one of these parts called? How many thirds make an apple? How many sixths? How many tenths? How many fifteenths?

21. Take the apple you have cut into halves, and cut each half into two equal parts.

22. What is one-half of one-half?

23. Cut another apple into halves, and cut each half into three equal parts.

24. Into how many equal parts is the apple now divided?

25. What is one of these six equal parts called?

26. How many sixths in one-half?

27. What is one-third of one-half?

28. What is $\frac{1}{2}$ of $\frac{1}{2}$?

29. What is $\frac{1}{3}$ of $\frac{1}{2}$?

30. What is $\frac{1}{4}$ of $\frac{1}{2}$? Illustrate.

31. What is $\frac{1}{5}$ of $\frac{1}{2}$? Illustrate.

32. What is $\frac{1}{7}$ of $\frac{1}{2}$? Illustrate.

33. Make a drawing of an apple cut into halves.

34. Make another, of an apple cut into thirds.

35. Make another, of an apple cut into 1 half and 2 fourths.

36. Make another, of an apple cut into fourths.

37. Make another, of an apple cut into 1 half and 3 sixths.

38. 1 half and how many halves make 1?

39. 1 half and how many quarters make 1?

40. 1 half and how many sixths make 1?

41. 1 half and how many fourths make 1?

42. 1 half and how many eighths make 1?

43. $\frac{1}{2}$ and how many tenths make 1?

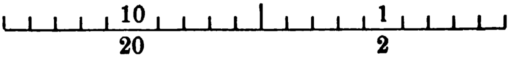
44. $\frac{1}{2}$ and how many twelfths make 1?

45. How many fourths in $\frac{1}{2}$?

46. How many sixths in $\frac{1}{2}$?

47. How many twentieths in $\frac{1}{2}$? *Answer.* There e $\frac{10}{20}$ in $\frac{1}{2}$.

48. Draw a line about three inches long, and illustrate.



49. How many eighths in ½? Illustrate.
50. How many fourteenths in ½? Illustrate.
51. How many twenty-fourths in ½? Illustrate.
52. How many twelfths in ½? Illustrate.
53. How many twelfths in 1? Illustrate.
54. How many fourths in 1? Illustrate.
55. How many fourths in ½? Illustrate.
56. Make a drawing of ½ of ½ of a pie.

LESSON II.

1. Represent by a drawing ½ of ½ of a circle.

2. How many degrees in the quarter of a circle which you have drawn?

3. Draw a square one inch on each side.

4. Divide this square into two equal parts, by means of a straight line drawn from two diagonally opposite corners.

5. What part of the square is the space each side of the line?

6. Draw a straight line from the other two diagonally opposite corners. Are the four spaces within the square equal? What fraction of the whole is each space?

7. Draw another square, and divide it into fourths in two other ways.

8. Cut a square of paper into fourths, cutting it as the first square was drawn.

9. Place the fourths together, and see if they are equal in size.

10. Cut a circular piece of paper into fourths.

11. If you have a pair of dividers in the schoolroom, your teacher will show you how to draw a circle for cutting.

12. Cut a circular piece of paper into eighths.

13. Cut a circular piece of paper into 1 half and 2 fourths, and lay the fractional parts together on your desk in a manner to form the original circle.

14. Cut a circular piece of paper into $\frac{2}{4}$ and $\frac{4}{8}$, and place the parts in the form of the original circle.

15. Cut another into $\frac{1}{2}$ and $\frac{3}{6}$, and lay the pieces together in a circle.

16. Another into $\frac{2}{4}$ and $\frac{4}{8}$, and form the circle as above.

17. $\frac{1}{2}$ equals how many fourths? How many sixths? How many eighths? How many tenths? How many twelfths?

18. How many fourths in 1? How many sixths in 1?

19. How many tenths in 1? Illustrate.

20. How many halves in 2? Illustrate.

21. How many halves in 3? Illustrate.

22. How many halves in 4? Illustrate.

23. How many halves in 6? Illustrate.

24. Cut a circular piece of paper into fractional parts, and write in figures on each piece the fraction which indicates its size.

25. Cut five circular pieces of paper into fractional parts, and label the parts with figures as above.

26. Draw five circles on your slate, and divide them each into fractional parts of different sizes, and label the parts as above. For instance, if a circle is divided into two equal parts, $\frac{1}{2}$ is to be written on both halves; but if divided into $\frac{1}{2}$ and $\frac{2}{4}$, on the larger part write $\frac{1}{2}$, and on each of the smaller parts $\frac{1}{4}$.

27. Draw six squares, and divide them each differently, placing the fraction which represents the fractional size of each part on that part.

* * *

LESSON III.

1. John gave $\frac{1}{2}$ of his apple to Jane and divided the other half equally with his brother. What part of the apple did he keep? What part did he give his brother?

2. One-half of a loaf of cake was eaten. The other half Susie's mother divided equally between Susie and her three brothers. What part of the cake did Susie have? What part did her three brothers have? What part did each brother have?

3. Henry, Fred, and Morrill ate $\frac{1}{2}$ of a water melon. If it was divided equally between them, what part of $\frac{1}{2}$ did each eat?

4. If $\frac{1}{2}$ of a fish weighs 2 pounds, what does the fish weigh?

5. If a fish weighs 5 pounds, what does $\frac{1}{2}$ of it weigh?

6. If a dish holds a quart when it is half full, how much will it hold when full? When a quarter full?

7. If ½ yard of satin costs $4.00, what will ¼ yard cost? 1 yard? 2 yards? 2½ yards?

8. How many halves in 2½? Illustrate with circles.

9. How many halves in 3½? In 6½? In 8½?

10. How many thirds in 1? In 2? In 2⅓? In 4? In 4⅔?

11. How many fourths in ¼? In ½? In 1? In 2? In 2¾?

12. Cut a circular piece of paper into fourths. If you destroy one of the fourths, what fraction of the circle is left?

13. If two-fourths are lost, what fraction remains? How many fourths remain? How many halves?

14. What fraction of ½ is ¼? *Answer.* ¼ is ½ of ½. Illustrate.

15. What fraction of ½ is ⅛? *Answer.* ⅛ is ¼ of ½. Illustrate.

16. What fraction of ½ is $\frac{1}{12}$? *Answer.* $\frac{1}{12}$ is ⅙ of ½. Illustrate.

17. What fraction of 5 is 1? *Answer.* 1 is ⅕ of 5.

18. What fraction of 10 is 5?

19. What fraction of 20 is 4? is 5? is 10? is 1?

20. What fraction of 12 is 6? is 11? is 4? is 3? is 1? is 2? is 5? is 7? is 8? is 9? is 10?

21. What part of 36 is 18? is 2? is 12? is 3? is 4? is 9? is 5? is 6? is 7? is 8? is 10? is 11? is 13?

22. What fractional part of 1 is ½?

23. What fractional part of 2 is ½? *Answer.* ½ is

¼ of 2. Illustrate by cutting 2 circular pieces of paper into halves.

24. What fraction of 3 is ½? *Answer.* ½ is ⅙ of 3. Illustrate by cutting 3 circular pieces of paper into halves.

25. What fraction of 4 is ½? Illustrate with drawings.

26. What fraction of 5 is ½? of 6 is ½? of 7 is ½?

27. What fraction of 1 dollar is ½ dollar?

28. What fraction of 2 dollars is ½ dollar?

29. What fraction of 3 dollars is ½ dollar?

30. What fraction of 4 dollars is ½ dollar?

31. What fraction of 1 dollar is a twenty-five-cent piece?

32. What fraction of 2 dollars is a twenty-five-cent piece?

33. What fraction of 3 dollars is ¼ of a dollar?

34. What fraction of 4 dollars is one-quarter of a dollar?

35. What fraction of 5 dollars is one-quarter of a dollar?

36. What part of ½ dollar is ¼ dollar?

LESSON IV.

1. What are fractions?

2. How is a fraction expressed?

3. What is the number above the line called?

4. What is the number below the line called?

5. What are the numerator and denominator taken together called?

6. What does the denominator denote?

7. What does the numerator denote?

8. What are integers?

9. What are an integer and fraction taken together?

10. Write a fraction; an integer; a mixed number.

11. If a fraction is less than 1, what is it called?

12. If more than 1, what is it called?

13. How do you know when it is less than 1? When greater? When just equal to 1?

14. Write five proper fractions; five improper fractions; five mixed numbers; five integers.

15. If the numerator is larger than the denominator, is the fraction proper or improper, and greater or less than 1?

16. If the numerator and denominator are the same, what is the value of the fraction?

17. Which is most, $\frac{2}{2}$, $\frac{3}{3}$, or $\frac{50}{50}$?

18. How much is $\frac{2}{2}$? is $\frac{3}{3}$? is $\frac{50}{50}$?

19. If, then, $\frac{2}{2}$, $\frac{3}{3}$, $\frac{4}{4}$, $\frac{5}{5}$, $\frac{50}{50}$, and so on infinitely, are the same, does it make any difference in the correct performance of a problem which is used?

20. Which is most convenient in practical use, large numbers or small numbers?

21. Then, if you should have the fraction $\frac{175}{175}$ given you upon which to perform an operation, would the result be the same if you should use $\frac{2}{2}$ or the unit 1?

22. Write a proper fraction; an improper fraction; a mixed number; an integer; an improper fraction which is equal to unity or one.

LESSON V.

1. What do you call the process of finding the smallest numbers to which the terms of a fraction can be changed without changing its value?

2. How do you reduce a fraction to its lowest terms?

3. Is the value of a fraction changed in reducing it to its lowest terms?

4. Can the fraction $\frac{6}{12}$ be reduced lower? can $\frac{3}{4}$? can $\frac{9}{12}$? can $\frac{9}{10}$? can $\frac{75}{100}$?

5. Can both proper and improper fractions be reduced to their lowest terms?

6. Reduce $\frac{20}{50}$ to its lowest terms; $\frac{12}{6}$; $\frac{9}{9}$; $\frac{4}{12}$; $\frac{18}{20}$; $\frac{10}{001}$; $\frac{15}{75}$.

7. Have you changed the value of any of the above fractions in reducing them to their lowest terms?

8. How does it affect the value of a fraction to divide both its numerator and denominator by the same number?

9. Does it either increase or diminish the value of a fraction to multiply both its numerator and denominator by the same number?

10. Reduce ten fractions to their lowest terms.

11. If both terms of $\frac{1}{2}$ are multiplied by 6, what will be obtained?

12. Which is greater, $\frac{1}{2}$ or $\frac{6}{12}$?

13. If both terms of $\frac{6}{18}$ are divided by 2, what will be obtained?

14. Which is greater, $\frac{6}{18}$ or $\frac{3}{9}$?

15. If both terms of $\frac{6}{18}$ are divided by 3, what will be obtained?

16. Which is greater, $\frac{6}{18}$ or $\frac{2}{6}$?

17. If both terms of $\frac{6}{18}$ are divided by 6, what will be obtained?

18. Which is greatest, $\frac{6}{18}$, $\frac{3}{9}$, $\frac{2}{6}$, or $\frac{1}{3}$?

19. Then if it does not alter their value, why do we reduce fractions to their lowest terms?

20. Reduce five fractions to their lowest terms.

21. How do you reduce fractions to their lowest terms?

22. In reducing a fraction to its lowest terms is the final result the same whether you divide by the greatest common divisor at once, or first by any common divisor convenient, and that result by another common divisor, and so on till nothing further will divide both terms?

23. What is a common divisor?

LESSON VI.

1. Can you speak of the common divisor of one number?

2. In this connection what does "common" mean?

3. How many numbers must be considered in order to apply to them the term, "common divisor"?

4. Do "common divisor" and "common multiple" mean the same?

5. What does "common multiple" mean?

6. Illustrate both common multiple and common divisor.

7. Can a whole number be reduced to a fraction?

8. What kind of a fraction will it be?

9. Can a proper fraction be reduced to a whole number? Why not?

10. Reduce 1 to tenths; to halves; to hundredths.

11. Change 2 to tenths; to thirds; to twenty-fifths.

12. Change 5 to hundredths.

13. Why are there 500 hundredths in 5?

14. Why are there 60 twelfths in 5?

15. Why are there 4 halves in 2?

16. Why are there 10 halves in 5?

17. Why are there 100 tenths in 10?

18. Which is greater, 1 unit or $\frac{6}{6}$? 2 units or $\frac{8}{6}$? 2 units or $\frac{12}{6}$?

19. Is a proper fraction ever large enough to make a unit?

20. Is an improper fraction always large enough to make a unit?

21. How do you reduce an improper fraction to a whole or mixed number?

22. How do you reduce a proper fraction to a whole or mixed number?

23. Explain how $\frac{12}{3}$ equals 4.

24. Reduce $\frac{10}{4}$, and explain. $\frac{9}{2}$; $\frac{12}{2}$; $\frac{18}{30}$.

25. How do you reduce a mixed number to an improper fraction?

26. Reduce $2\frac{1}{2}$ to an improper fraction, and explain. $6\frac{2}{3}$; $3\frac{1}{5}$; $4\frac{12}{20}$.

27. Can all fractions be changed to whole numbers? Why not?

28. Can a whole number always be changed to a fraction? Can a mixed number?

29. Will mixed numbers produce proper fractions or improper fractions?

30. Give a rule for reducing an improper fraction to a mixed number.

31. Give a rule for reducing a mixed number to an improper fraction.

32. Give a rule for reducing a fraction to its lowest terms.

33. In all these operations is the size of the number changed?

34. Which is the most, $\frac{3}{2}$ of a dollar, $\frac{6}{4}$ of a dollar, $\frac{12}{8}$ of a dollar, or $1\frac{1}{2}$ dollars?

LESSON VII.

1. We have learned that if we divide both terms of a fraction, or multiply both terms, by the same number, the value of the fraction is not changed. Now if one term is either multiplied or divided, while the other is not, will the value be changed?

2. If the numerator is multiplied, will the value be increased or diminished? Illustrate.

3. Which is larger, $\frac{3}{2}$ or $\frac{6}{2}$?

4. If the numerator is divided, will the value be increased or diminished? Illustrate.

5. If the denominator is multiplied, will the value be increased or diminished? Illustrate.

6. If the denominator is divided, will the value be increased or diminished? Illustrate.

7. By what do we divide the terms of a fraction to reduce it to its lowest terms?

8. If it is not apparent what the greatest common divisor is, how do you proceed?

9. What does the denominator show?

10. What does the numerator show?

11. If the number which names the parts into which a unit is divided is large, is the part large or small?

12. If the number which names the parts into which a unit is divided is small, is the part large or small?

13. Which would you rather have, $\frac{1}{2}$ of a dollar or $\frac{1}{50}$ of a dollar? $\frac{1}{4}$ of a pie or $\frac{1}{10}$ of a pie?

14. How can a whole number be expressed in a fractional form?

15. Is $\frac{6}{1}$ the same as the integer 6? $\frac{10}{1}$ as 10? $\frac{19}{1}$ as 19?

16. Of what denomination is $\frac{1}{2}$? $\frac{3}{4}$? $\frac{5}{6}$? $\frac{7}{8}$? $\frac{9}{10}$?

17. What is meant by the denomination of a fraction?

18. What is the name of the parts into which a unit was divided to produce $\frac{1}{2}$? $\frac{6}{18}$? $\frac{1}{12}$? $\frac{11}{20}$? $\frac{5}{9}$?

19. Of what denomination is $\frac{2}{2}$? $\frac{4}{4}$? $\frac{6}{6}$? $\frac{10}{10}$? Which is the largest?

20. How can a whole number be expressed in any fractional denomination? *Answer.* A whole number can be expressed in any denomination by reducing it to the desired denomination.

21. How is it reduced to any desired denomination? *Answer.* It is reduced to any desired denomination by multiplying it by the number expressing that denomination.

22. Reduce and explain the following examples, thus: reduce three to fifths. Since there are 5 fifths in 1 unit, in 3 units there are 3 times 5 fifths, which is $\frac{15}{5}$.

23. Reduce 4 to thirds; 3 to thirds; 7 to halves; 5 to tenths; 8 to fourths; 9 to halves; 2 to sevenths.

24. Can each of the above improper fractions be reduced back to units?

25. How do you reduce $\frac{15}{5}$ to units? *Explanation.* Since 5 fifths make 1 unit, there are as many units in $\frac{15}{5}$ as the number of times 5 fifths is contained in 15 fifths, which is 3 times; hence $\frac{15}{5} = 3$.

26. Reduce $\frac{12}{3}$ to units, and explain as above; $\frac{9}{3}$; $\frac{14}{7}$; $\frac{50}{10}$; $\frac{32}{4}$; $\frac{18}{2}$.

27. In reducing a whole number to a fractional form, is its value changed?

28. Will a whole number reduced to a fractional form ever produce a proper fraction? Why not?

29. What kind of fraction is produced by reducing units to a fractional form?

30. What is a divisor of a number?

31. What is a multiple of a number?

32. What is a common divisor of two or more numbers?

33. What is a common multiple of two or more numbers?

34. Give an example of the divisor of a number.

35. Of the multiple of a number.

36. Of a common divisor of two or more numbers.

37. Of a common multiple of two or more numbers.

38. Is 4 a divisor or a multiple of 8?

39. Is 8 a divisor or a multiple of 4?

40. Is 3 a divisor of 7? Why not?

41. Is 24 a multiple of 6?

42. Is 24 a multiple of 8? of 12? of 2? of 7? of 9?

43. Which of the numbers 8, 12, 2, 7, and 9 are divisors of 24?

44. Are the factors of the numbers its divisors?

45. Give the divisors of 60; of 64; of 96; of 108; of 1000.

46. Reduce ten improper fractions to whole or mixed numbers.

47. Reduce ten whole numbers to a fractional form.

48. Reduce two whole numbers to thirds; five whole numbers to tenths; five whole numbers to twentieths.

LESSON VIII.

REDUCING FRACTIONS TO A COMMON DENOMINATOR.

1. When have fractions a common denominator?

2. Can any number of fractions be so changed without changing their value that all shall have denominators alike?

3. What are they then said to have?

4. Is it for convenience that fractions are reduced to a common denominator, or because they cannot otherwise be added and subtracted?

5. Why are fractions reduced to their lowest terms?

6. The least common denominator of several fractions will be the least common multiple of their denominators.

7. In reducing $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$ to a common denominator, can you see at once what is the least common multiple of 2, 3, 4, and 6?

8. Having determined it to be 12, how do you reduce $\frac{1}{2}$ to twelfths?

9. Explain the process of reducing $\frac{2}{3}$ to twelfths, thus: since there are 12 twelfths in 1 unit, in $\frac{1}{3}$ there is $\frac{1}{3}$ of 12 twelfths, which is 4 twelfths, and in $\frac{2}{3}$ there are 2 times $\frac{4}{12}$, which are $\frac{8}{12}$.

10. Explain the process of reducing $\frac{2}{3}$ to twelfths in the same manner; $\frac{3}{4}$; $\frac{5}{6}$.

11. Reduce $\frac{1}{2}$, $\frac{6}{7}$, $\frac{5}{14}$, $\frac{3}{4}$, and $\frac{9}{28}$ to a common denominator.

12. What is the least common multiple of 2, 7, 14, 4, and 28?

LESSON IX.

ADDITION OF FRACTIONS.

1. How are fractions added when their denominators are alike?

2. Are the denominators of fractions ever added?

3. Can fractions be added when their denominators are unlike?

4. What do we say of fractions whose denominators are alike?

5. If fractions are to be added which have not a common denominator, what must first be done?

6. In changing fractions to a common denominator, is the value changed?

7. How do you reduce fractions to a common denominator?

8. Is it the greatest common divisor, or the least common multiple of the denominators, which is found for the common denominator?

9. What is the process of finding the least common multiple of the denominators of several fractions, and then reducing all of the fractions to that denomination?

10. Find the least common denominator of $\frac{2}{12}$ and $\frac{3}{20}$; now reduce both the fractions to sixtieths. What have you done in these two operations? Have you changed the value of the fractions? If not, why should you change the form?

11. Add $\frac{1}{6} + \frac{5}{6} + \frac{3}{6} + \frac{2}{6}$. Is it necessary to reduce these fractions to a common denominator? Why not?

12. Can you add $\frac{1}{2}$ and $\frac{1}{7}$ and $\frac{1}{3}$ and $\frac{1}{6}$ without reducing them to a common denominator? Why not? *Answer.* Because different denominations cannot be added.

$$\begin{array}{r|cccc} 2 & \frac{1}{2} & \frac{1}{7} & \frac{1}{3} & \frac{1}{6} \\ \hline 3 & 4 & 7 & 3 & 3 \\ \hline & 1 & 7 & 1 & 1 \end{array}$$

$$\tfrac{1}{2} = \tfrac{21}{42}. \quad \tfrac{1}{7} = \tfrac{6}{42}. \quad \tfrac{1}{3} = \tfrac{14}{42}. \quad \tfrac{1}{6} = \tfrac{7}{42}.$$

$$\tfrac{21}{42} + \tfrac{6}{42} + \tfrac{14}{42} + \tfrac{7}{42} = \tfrac{4}{42} = 1\tfrac{1}{7}.$$

13. What is the first step in adding the above fractions? After finding the least common multiple of the denominators, what is the next step?

14. After adding their numerators, what is the next step, should the result prove to be an improper fraction?

15. After having reduced the improper fraction to a whole number, should there be a fraction also, what should be asked of it?

16. If it is not at the lowest terms, what should then be done?

17. When reduced to its lowest terms, where should it be placed?

18. Together with the whole number what will it be called?

19. Now from the above process give a rule for the addition of fractions.

20. Add five proper fractions of different denominations.

21. Are the denominators of fractions ever added?

22. How is a fraction added to a whole number?

23. What is the sum of $\frac{1}{2}$ and 6? of 3 and $\frac{3}{4}$? of 8 and $\frac{1}{5}$? of $\frac{9}{10}$ and 7?

24. How is a mixed number added to a whole number?

25. What is the sum of $1\frac{2}{3}$ and 3? of 4 and $3\frac{1}{2}$? of 7 and $9\frac{2}{5}$? of 10 and $10\frac{1}{2}$?

26. How is a mixed number added to a fraction?

27. What is the sum of $1\frac{1}{2}$ and $\frac{1}{2}$? of $3\frac{3}{4}$ and $\frac{2}{3}$? of $6\frac{1}{4}$ and $\frac{11}{12}$? of $\frac{4}{5}$ and $1\frac{2}{7}$?

28. How are mixed numbers added together?

Answer. By adding the whole numbers and fractions separately, and then adding these results together.

29. What is the sum of $1\frac{1}{4}$ and $1\frac{1}{4}$? of $1\frac{3}{4}$ and $3\frac{1}{4}$ and $6\frac{5}{4}$? of $9\frac{1}{8}$ and $2\frac{7}{12}$ and $5\frac{3}{4}$ and $1\frac{1}{2}$?

30. Add four mixed numbers whose fractions have a common denominator.

31. Add six whose fractions have not a common denominator.

32. Add $3\frac{3}{5}$ to 8; $\frac{9}{14}$ to 7; 6 to $\frac{5}{84}$; $\frac{2}{7}$ to $\frac{5}{7}$; $\frac{3}{19}$ and $\frac{14}{38}$ and $\frac{1}{2}$ =? 3 to $\frac{8}{9}$; $\frac{6}{13}$ to 1; 3 and 21; $1\frac{1}{2}$ and $6\frac{1}{2}$ and $9\frac{1}{2}$; $3\frac{1}{4}$ and $6\frac{2}{3}$ and $7\frac{1}{9}$ and $1\frac{1}{12}$.

33. Reduce $\frac{39}{78}$ to its lowest terms.

34. Reduce 4 to halves.

35. Reduce $3\frac{6}{7}$ to an improper fraction.

36. Reduce 1 to sevenths.

37. Reduce $\frac{11}{10}$ to a whole or mixed number.

38. What is the greatest common divisor of 12 and 30?

39. What is the least common multiple of 12 and 30?

40. Reduce $25\frac{3}{10}$ to an improper fraction.

41. Add $\frac{3}{4}$, $\frac{9}{12}$, $\frac{6}{7}$, $\frac{4}{11}$, and $\frac{1}{3}$.

42. Add $\frac{3}{5}$, $\frac{7}{15}$, $\frac{1}{20}$, $\frac{7}{30}$, $\frac{19}{60}$, $\frac{5}{12}$, $\frac{1}{3}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{10}$, and $\frac{1}{2}$.

43. Perform all the examples in your Common School Arithmetic under Addition of Fractions.

LESSON X.

SUBTRACTION OF FRACTIONS.

1. Can fractions not having common denominators be subtracted one from the other?

2. Having a common denominator, how do you subtract one from another?

3. Must the numerator of the minuend be larger or smaller than the numerator of the subtrahend?

4. Which must have the largest denominator, the minuend or the subtrahend?

5. In the example $\frac{3}{7} - \frac{2}{7}$, which is the minuend? What is $\frac{2}{7}$? What is the result?

6. Have $\frac{3}{7}$ and $\frac{2}{7}$ a common denominator? What is it?

7. What is the first step in subtracting $\frac{1}{2}$ from $\frac{3}{4}$?

8. Which is the subtrahend?

9. Perform the operation.

10. Subtract $\frac{3}{4}$ from 1.

11. What do you consider the 1?

12. Subtract $1\frac{3}{4}$ from 2; thus: $\frac{3}{4}$ from $\frac{4}{4}$ leaves $\frac{1}{4}$, and 1 from 1 leaves nothing.

$$\begin{array}{r} 2 \\ \underline{1\frac{3}{4}} \\ \frac{1}{4}. \end{array}$$

13. Where did you get $\frac{4}{4}$ from which you subtract $\frac{3}{4}$?

14. Why do you consider the minuend as 1 instead of 2?

15. Subtract $2\frac{1}{4}$ from 7; thus: $\frac{1}{4}$ from $\frac{4}{4}$ leaves $\frac{3}{4}$; 2 from 6 leaves 4.

$$\begin{array}{r} 7 \\ \underline{2\frac{1}{4}} \\ 4\frac{3}{4}. \end{array}$$

16. Did you take 1 from the minuend 7 and reduce it to fourths to get $\frac{4}{4}$?

17. Why did you subtract 2 from 6 instead of from 7?

18. Subtract:

$6\frac{1}{2}$ from 7. $2\frac{2}{3}$ from 5. $4\frac{1}{8}$ from 24.
$6\frac{1}{2}$ from 12. $8\frac{1}{7}$ from 9. $25\frac{2}{15}$ from 50.
$5\frac{1}{5}$ from 10.

19. Subtract:

12 from $15\frac{1}{2}$. 9 from $12\frac{2}{3}$.
2 from $6\frac{6}{7}$. 8 from $16\frac{5}{9}$.

20. In the above examples, where one term is a mixed number and the other term is a whole number, is it necessary to reduce them to improper fractions and then to a common denominator?

21. If both minuend and subtrahend are mixed numbers, must they be reduced to a fractional form?

22. Can mixed numbers be added without reducing them to improper fractions? How?

23. Can they be subtracted?

24. Can you add an indefinite number of fractions? of mixed numbers? of whole numbers?

25. Can you subtract an indefinite number?

26. How many numbers, and only how many, are necessary to perform the operation of subtraction?

27. Add $1\frac{1}{2}$ and $3\frac{2}{3}$.

28. Subtract $1\frac{1}{2}$ from $3\frac{2}{3}$.

29. Could you subtract $\frac{1}{2}$ from $\frac{1}{3}$? Why not?

30. Subtract $\frac{1}{3}$ from $\frac{1}{2}$.

31. Subtract a whole number from a mixed number.

32. Subtract a mixed number from a whole number.

33. Subtract a fraction from unity.

34. Subtract one fraction from another.

35. Subtract a fraction from a whole number by two different methods.

36. Subtract a fraction from a mixed number.

37. Why can you not subtract either a whole number or a mixed-number from a proper fraction?

38. Is a fraction, unless it be an improper fraction, always less than unity or one?

39. How may you always know a proper fraction?

40. If the numerator is equal to or larger than the denominator, can it properly be considered a fraction? What is it?

41. In the above example, "$2\frac{1}{4}$ subtracted from 7," you performed the operation without reducing 7 to an improper fraction. You may now reduce the 7 to fourths and see if the result will be the same.

42. Is the result the same?

43. Subtract $6\frac{1}{2}$ from 7 by both processes. Are the results the same? $3\frac{1}{2}$ from 8; $6\frac{3}{7}$ from 10; $1\frac{3}{5}$ from 4; $8 - 7\frac{1}{3}$; $12 - 9\frac{1}{2}$; $6\frac{1}{2}$ from 15; $8 - 1\frac{6}{7}$; $9 - \frac{8}{9}$; $\frac{2}{3}$ from 3.

44. Add three mixed numbers.

45. Subtract one mixed number from another.

46. If the fraction in the minuend is larger than the fraction in the subtrahend, can you subtract without reducing the mixed numbers to improper fractions?

47. If the fraction in the subtrahend is the larger, what must be done?

48. Add a whole number and a mixed number.

49. Subtract a whole number from a mixed number.

50. Subtract a mixed number from a whole number.

51. Add a mixed number and a whole number.

52. In adding does it make any difference which you consider first, the whole number or the mixed number?

53. Is adding a whole number to a mixed number just the same as adding a mixed number to a whole number?

54. Is $3 + 5\frac{1}{2}$ the same as $5\frac{1}{2} + 3$?

55. Is subtracting a whole number from a fraction the same as subtracting a fraction from a whole number?

56. Add several mixed numbers and fractions.

57. Subtract a mixed number from a fraction.

58. In order to subtract a mixed number from a fraction, which should that fraction be, proper or improper?

59. Subtract a fraction, either proper or improper, from a mixed number, by two different processes.

60. Add several fractions together.

61. Subtract one fraction from another, both being proper fractions.

62. Add a fraction to itself.

63. Subtract a fraction from itself.

64. Add a mixed number to itself.

65. Subtract a mixed number from itself.

66. Add a fraction to unity.

67. Subtract a fraction from unity.

68. What kind of fraction must it be which can be taken from unity?

69. Add 1 to a fraction.

70. Subtract 1 from a fraction.

71. What kind of a fraction must it be from which 1 can be subtracted?

72. Perform the following:

$27 - 6\frac{1}{2} =$ $\quad 3\frac{4}{7} - 3\frac{1}{7} =$ $\quad 37 - 27\frac{3}{4} =$

$32 + \frac{1}{2} =$ $\quad 5\frac{1}{2} - 2\frac{1}{4} =$ $\quad 100 - 99\frac{2}{8} =$

$45 - \frac{3}{4} =$ $\quad 8\frac{2}{8} - 7\frac{5}{8} =$ $\quad 16\frac{3}{4} - 8 =$

$147\frac{3}{8} - 25 =$ $\quad \frac{3}{5} - \frac{2}{8} =$ $\quad 44\frac{1}{2} - 6 =$

$8 + 8\frac{3}{4} =$ $\quad 125 - 40\frac{1}{2} =$

$\frac{1}{2} + 6 + 7\frac{1}{2} + \frac{2}{7} + 3\frac{1}{14} + 9 =$

73. Perform all the examples in your Arithmetic under Subtraction of Fractions.

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LESSON XI.

MULTIPLICATION OF FRACTIONS.

1. When the kind of fraction is not indicated, a *proper* fraction is always understood.

2. Make the sign of multiplication. Describe it.

3. The word "of" is also used to express the multiplication of fractions.

4. Describe the sign of addition.

5. What does "of" between fractions or numbers indicate?

6. What is $\frac{1}{2}$ of 8? $\frac{1}{3}$ of 9? $\frac{1}{4}$ of 16?

7. Are $\frac{1}{2}$ of 4 and $\frac{1}{2} \times 4$ and $4 \times \frac{1}{2}$ and 4 times $\frac{1}{2}$ all the same?

8. Write "$\frac{1}{3}$ of 12" in as many forms as possible.

9. Does it increase or diminish a number to multiply it by a fraction?

10. Multiply 4 by $\frac{1}{2}$.

11. Which is larger, 4 or the result of multiplying 4 by $\frac{1}{2}$?

12. Does it diminish a number to multiply it by an improper fraction? $\frac{1}{3} \times 2 = \frac{2}{3}$.

13. How do you multiply a fraction by a whole number? Illustrate. $6 \times \frac{2}{3} = \frac{12}{3} = 4$.

14. How do you multiply a whole number by a fraction? Illustrate.

15. Can you multiply several fractions together by a single operation?

16. Can you add several fractions by a single operation?

17. Can you subtract several fractions by a single operation? $\frac{1}{3} \times \frac{1}{2} \times \frac{2}{5} = \frac{2}{30} = \frac{1}{15}$.

18. How do you multiply fractions together? Illustrate.

19. Multiply $\frac{1}{2}$ and $\frac{3}{4}$ and $\frac{1}{3}$ together.

20. Express the multiplication in two ways.

21. Are $\frac{1}{5}$ of $\frac{3}{4}$ of $\frac{2}{7}$ of $\frac{1}{2}$ and $\frac{1}{5} \times \frac{3}{4} \times \frac{2}{7} \times \frac{1}{2}$ the same?

22. What is the answer?

23. In the example $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times \frac{5}{6}$ there are several numbers found in both numerators and denominators. When this is the case, how can the work of multiplication be shortened?

24. What is this process of striking out factors from both numerator and denominator called?

25. Is the result the same when factors are cancelled as when all the numerators and denominators are multiplied together?

26. Perform the example $\frac{2}{3} \times \frac{3}{5} \times \frac{5}{7} \times \frac{1}{2} =$ by cancellation.

27. Perform it by multiplying all the numerators and denominators together.

28. Which is the longer operation?

29. Then why do we use cancellation?

30. Multiply four fractions together.

31. In the example $\frac{1}{2} \times \frac{1}{3} \times \frac{5}{7} \times \frac{11}{12} =$, are there any factors which can be cancelled?

32. Can you perform the example by cancellation?

33. Perform five examples in which three fractions are multiplied together, first using the process by cancellation, and then the other method, of multiplying together the numerators for a numerator, and the denominators for a denominator.

34. How do you multiply a fraction by a mixed number?

35. A mixed number by a fraction?

36. Is the result of multiplying $\frac{2}{3}$ by $8\frac{1}{2}$ the same as the result of multiplying $8\frac{1}{2}$ by $\frac{2}{3}$?

37. Multiply $12\frac{5}{6}$ by $\frac{1}{2}$.

38. Multiply $\frac{2}{3}$ by $125\frac{1}{2}$; $\frac{3}{4}$ by $10\frac{1}{4}$; $\frac{2}{5}$ by $1\frac{1}{2}$; $3\frac{2}{3}$ by $\frac{4}{7}$ by $\frac{1}{2}$.

39. How do you multiply mixed numbers together?

40. Multiply $1\frac{1}{2}$ by $1\frac{1}{2}$; $6\frac{7}{10}$ by $3\frac{1}{2}$; $4\frac{2}{3}$ by $3\frac{2}{3}$ by $1\frac{4}{5}$; $123\frac{1}{2}$ by $\frac{2}{3}$ by $1\frac{1}{2}$; $2\frac{1}{2}$ by $2\frac{1}{2}$; $1\frac{1}{8}$ by $1\frac{1}{3}$; $12\frac{1}{2}$ by $16\frac{2}{3}$; $3\frac{2}{3}$ by $37\frac{1}{2}$; $400\frac{1}{10}$ by $\frac{6}{7}$; $137\frac{2}{9}$ by $8\frac{1}{4}$; $25\frac{1}{25}$ by $1\frac{3}{4}$; $3\frac{3}{4}$ by $33\frac{1}{8}$; $27\frac{1}{2}$ by $1\frac{3}{7}$; $9\frac{1}{9}$ by 1; 1 by $20\frac{3}{4}$; $\frac{3}{7}$ by $1\frac{2}{9}$; $12\frac{2}{3}$ by $1\frac{1}{2}$; $2\frac{1}{5}$ by $8\frac{3}{4}$.

41. Multiply $3\frac{1}{2}$ by 3 in two ways; thus:

$$\begin{array}{r} 3\frac{1}{2} \\ 3 \\ \hline 1\frac{1}{2} \\ 9 \\ \hline 10\frac{1}{2} \end{array} \text{ *Answer.* } \quad \text{or} \quad 3\frac{1}{2} \times 3 = \frac{7}{2} \times 3 = \frac{21}{2} = 10\frac{1}{2}.$$

42. Multiply $125\frac{1}{3}$ by 6; thus:

$$\begin{array}{r} 125\frac{1}{3} \\ 6 \\ \hline 2 \\ 750 \\ \hline 752 \end{array} \text{ *Answer.* } \quad \text{or} \quad 125\frac{1}{3} \times 6 = \frac{376}{3} \times 6 = \frac{2256}{3} = 752.$$

43. Multiply $45\frac{6}{7}$ by 12; thus:

$$\begin{array}{r} 45\frac{6}{7} \\ 12 \\ \hline 10\frac{2}{7} \\ 540 \\ \hline 550\frac{2}{7} \end{array} \text{ *Answer.* } \quad \text{or} \quad 45\frac{6}{7} \times 12 = \frac{321}{7} \times 12 = \frac{3852}{7} = 550\frac{2}{7}.$$

44. Multiply $12\frac{1}{2}$ by 7 by both processes. $25\frac{1}{5}$ by 25. $4\frac{1}{2}$ by 4.

45. Multiply 28 by $1\frac{1}{2}$; thus:

$$\begin{array}{r} 28 \\ 1\frac{1}{2} \\ \hline 14 \\ 28 \\ \hline 42 \end{array} \text{ *Answer.* } \quad \text{or} \quad 28 \times \frac{3}{2} = \frac{84}{2} = 42.$$

46. Multiply 100 by $4\frac{1}{2}$; thus:

$$\begin{array}{r} 100 \\ \underline{4\frac{1}{2}} \\ 50 \\ \underline{400} \\ 450 \end{array}\ \textit{Answer.} \qquad \text{or} \qquad 100\times\frac{9}{2}=\frac{900}{2}=450.$$

47. Multiply 136 by $2\frac{2}{3}$; thus:

$$\begin{array}{r} 136 \\ \underline{2} \\ 3\underline{)272} \\ 90\frac{2}{3} \end{array} \qquad \begin{array}{r} 136 \\ \underline{2\frac{2}{3}} \\ 90\frac{2}{3} \\ \underline{272} \\ 362\frac{2}{3} \end{array}\ \textit{Answer.} \qquad \text{or} \qquad 136\times\frac{8}{3}=\frac{1088}{3}=362\frac{2}{3}.$$

48. Multiply 47 by $1\frac{4}{5}$; thus:

$$\begin{array}{r} 47 \\ \underline{4} \\ 5\underline{)188} \\ 37\frac{3}{5} \end{array} \qquad \begin{array}{r} 47 \\ \underline{1\frac{4}{5}} \\ 37\frac{3}{5} \\ \underline{47} \\ 84\frac{3}{5} \end{array}\ \textit{Answer.} \qquad \text{or} \qquad 47\times\frac{9}{5}=\frac{423}{5}=84\frac{3}{5}.$$

49. Multiply 125 by $6\frac{2}{3}$, by two processes; 16 by $3\frac{3}{4}$; 20 by $6\frac{1}{2}$; $27\frac{1}{2}$ by 6; 27 by $6\frac{1}{2}$; 40 by $3\frac{2}{3}$; 800 by $1\frac{1}{2}$; $1\frac{1}{2}$ by 4; 4683 by $125\frac{2}{3}$; $864\frac{2}{3}$ by 42; $9\frac{1}{3}$ by 9.

50. Give two rules for multiplying a mixed number by a whole number.

51. Write two rules for multiplying a whole number by a mixed number.

52. Do fractions require to be reduced to a common denominator in order to be added? to be multiplied? to be subtracted? to be divided?

53. Add 4 fractions.

54. Subtract one fraction from another.

55. Multiply two fractions together.

56. Add three mixed numbers and two fractions.

57. Subtract one mixed number from another where the fraction in the minuend is greater than the fraction in the subtrahend.

58. Subtract one mixed number from another having the fraction in the minuend smaller than the fraction in the subtrahend.

59. Multiply one mixed number by another.

60. Multiply a whole number by a mixed number.

61. Multiply a mixed number by a whole number.

62. Multiply a mixed number by a fraction.

63. Multiply a fraction by a mixed number.

64. How does it affect a fraction to multiply its numerator?

65. How does it affect a fraction to multiply its denominator?

66. How does it affect a fraction to divide its numerator?

67. How does it affect a fraction to divide its denominator?

68. If you wish to multiply a fraction, which will you multiply, the numerator or the denominator?

69. Instead of multiplying the numerator, what may be done to the denominator?

70. If you wish to multiply $\frac{3}{4}$ by 2, will it make any difference in the result whether you multiply 3 by 2 and get $\frac{6}{4}$, or divide 4 by 2 and get $\frac{3}{2}$?

71. Are $\frac{6}{4}$ and $\frac{3}{2}$ the same?

72. Then, in what two ways can you make a fraction larger?

73. Illustrate with five examples how you can increase or multiply a fraction in two ways and have the result the same.

74. Perform ten examples in which six or more fractions are multiplied together.

75. Perform all the examples in your Arithmetic in Multiplication of Fractions.

LESSON XII.

DIVISION OF FRACTIONS.

1. Is a fraction divided by dividing its numerator or by dividing its denominator?

2. In what other way may a fraction be divided?

3. Divide $\frac{4}{7}$ by 2 by dividing its numerator, then by multiplying its denominator.

4. Are the results the same?

5. Is $\frac{2}{7}$ the same as $\frac{4}{14}$?

6. Then how do you divide a fraction by a whole number? *Answer.* Divide the numerator of the fraction by the whole number if it can be done without a remainder; otherwise, multiply the denominator by the whole number.

7. Divide $\frac{6}{7}$ by 3; $\frac{8}{12}$ by 4; $\frac{9}{27}$ by 9; $\frac{4}{12}$ by 3; $\frac{2}{8}$ by 8; $\frac{12}{20}$ by 7; $\frac{7}{12}$ by 2; $\frac{8}{11}$ by 2.

8. How do you divide a whole number by a fraction? *Answer.* Multiply the whole number by the denominator of the fraction, and divide the result by the numerator.

9. Divide:

12 by $\frac{3}{4}$. 16 by $\frac{8}{11}$. 4 by $\frac{2}{3}$.
3 by $\frac{2}{3}$. 25 by $\frac{5}{6}$. 24 by $\frac{1}{10}$.
8 by $\frac{1}{2}$. 300 by $\frac{1}{2}$. 6 by $\frac{1}{3}$.

10. If the numerator is contained in the whole number without a remainder, do you multiply or divide first?

11. In the example $9 \div \frac{3}{4}$ would you first multiply 9 by 4, and then divide by 3, or would you divide 9 by 3, and then multiply by 4?

12. Why do you divide before multiplying when possible?

13. Is it *always* desirable to shorten an operation?

14. Does it increase or diminish a number to divide it by a proper fraction? Illustrate.

15. Does it increase or diminish a number to multiply it by a proper fraction? Illustrate.

16. If you multiply 10 by $\frac{2}{3}$, what is the answer?

17. If you divide 10 by $\frac{2}{3}$, what is the answer?

18. Which answer is the larger, the one from multiplying or dividing?

19. Does it make a number larger or smaller to divide it by a whole number?

20. Does it make a number larger or smaller to divide it by a fraction?

21. Does it make a number larger or smaller to multiply it by a fraction?

22. Does it make a number larger or smaller to multiply it by a whole number?

23. How do you divide one fraction by another? *Answer.* Multiply the numerator of the dividend by the denominator of the divisor, and the denominator of the dividend by the numerator of the divisor.

24. In the example $\frac{3}{4} \div \frac{2}{6} = 2\frac{1}{4}$, which is the dividend? which is the divisor?

25. By what do you multiply 3, the numerator of the dividend?

26. By what do you multiply 4, the denominator of the dividend?

27. What do you get for an answer?

28. Is the answer $\frac{18}{8}$ a proper or an improper fraction?

29. To what form should it be changed?

30. What is the correct answer?

31. Divide:

$\frac{1}{2}$ by $\frac{6}{7}$. $\frac{4}{11}$ by $\frac{3}{4}$. $\frac{3}{5}$ by $\frac{7}{2}$. $\frac{8}{40}$ by $\frac{20}{25}$.
$\frac{12}{18}$ by $\frac{2}{3}$. $\frac{2}{3}$ by $\frac{1}{2}$. $\frac{4}{10}$ by $\frac{2}{3}$. $\frac{100}{50}$ by $\frac{1}{2}$.
$\frac{9}{12}$ by $\frac{6}{7}$. $\frac{12}{20}$ by $\frac{1}{8}$. $\frac{9}{12}$ by $\frac{3}{5}$. $\frac{6}{10}$ by $\frac{1}{5}$.

32. How do you divide a whole number by a mixed number? *Answer.* Reduce the mixed number to an improper fraction, and divide the whole number by it.

33. Divide:

8 by $1\frac{1}{2}$. 40 by $6\frac{2}{5}$. 9 by $4\frac{3}{4}$.
12 by $3\frac{1}{3}$. 10 by $3\frac{1}{2}$. 11 by $1\frac{6}{7}$.
20 by $6\frac{2}{3}$. 10 by $3\frac{1}{3}$. 8 by $8\frac{3}{5}$.

34. How do you divide a mixed number by a whole number?

35. Divide $6\frac{1}{2}$ by 3 in two ways; thus:

$$6\frac{1}{2} \div 3 = \frac{13}{2} \div 3 = \frac{13}{6)\underline{13}} \qquad \text{or} \qquad 3)\underline{6\frac{1}{2}}$$
$$2\frac{1}{6}\ \textit{Answer.} \qquad\qquad 2\frac{1}{6}\ \textit{Answer.}$$

36. Divide $32\frac{3}{4}$ by 4 in two ways.

37. Divide $102\frac{3}{7}$ by 4 by both processes.

38. Divide all of the following by both methods:

$127\frac{1}{2} \div 6 = ?$ $12\frac{3}{4} \div 5 = ?$ $8064\frac{3}{4} \div 9 = ?$
$9\frac{2}{3} \div 9 = ?$ $108\frac{3}{7} \div 7 = ?$ $1\frac{6}{7} \div 9 = ?$
$75\frac{6}{7} \div 3 = ?$ $231\frac{1}{2} \div 6 = ?$ $3\frac{2}{3} \div 10 = ?$
$9\frac{1}{2} \div 4 = ?$ $3\frac{3}{4} \div 12 = ?$ $346\frac{8}{14} \div 12 = ?$
$12\frac{3}{4} \div 6 = ?$ $125\frac{3}{6} \div 14 = ?$ $346\frac{8}{9} \div 2 = ?$

39. How do you divide a mixed number by a fraction?

40. How do you divide a fraction by a mixed number?

41. How do you divide one mixed number by another?

42. Divide:

$1\frac{1}{2}$ by $3\frac{1}{2}$. $1\frac{3}{6}$ by $\frac{6}{11}$. $1\frac{6}{7}$ by $\frac{6}{7}$. $\frac{4}{5}$ by $1\frac{6}{8}$.
$6\frac{2}{6}$ by $1\frac{2}{3}$. $8\frac{1}{3}$ by $8\frac{1}{14}$. $\frac{3}{4}$ by $1\frac{2}{3}$. 1 by $\frac{1}{2}$.
$\frac{5}{6}$ by $1\frac{4}{7}$. $3\frac{2}{6}$ by $1\frac{2}{3}$. $3\frac{6}{7}$ by $6\frac{1}{2}$. $\frac{1}{2}$ by 1.

43. Divide a fraction by a whole number.

44. Divide a fraction by a mixed number.

45. Divide a whole number by a fraction.

46. Divide one fraction by another.

47. Divide one mixed number by another.

48. Divide a whole number by a mixed number.

49. Divide a mixed number by a fraction.

50. Divide a mixed number by a whole number.

51. Multiply one fraction by another.

52. Add two fractions together.

53. Subtract one fraction from another.

54. Divide one fraction by another.

55. Add a whole number, a fraction, and a mixed number together.

56. Subtract a mixed number from an improper fraction.

57. Can a mixed number be subtracted from a proper fraction? Why not?

58. Multiply a mixed number by a whole number.

59. Divide a mixed number by a whole number in two ways.

60. Subtract a mixed number from a whole number in two ways.

61. Add a mixed number to a whole number.

62. Multiply a whole number by a mixed number.

63. Divide a whole number by a mixed number.

64. Subtract a whole number from a mixed number.

65. Add a whole number to a mixed number.

66. Multiply a fraction by a mixed number.

67. Divide a fraction by a mixed number.

68. Add a fraction and a mixed number.

69. Subtract a fraction from a mixed number.

70. Multiply a mixed number by a fraction.

71. Divide a mixed number by a fraction.

72. Subtract a mixed number from a fraction.

73. Add a fraction, a whole number, and a mixed number.

74. Multiply a fraction, a whole number, and a mixed number together.

75. Which is larger:

$\frac{2}{3}$ or $\frac{2}{7}$? $\frac{}{16}$ or $\frac{7}{8}$? $\frac{6}{7}$ or $\frac{9}{10}$? $\frac{1}{2}$ or $\frac{7}{14}$?
$\frac{3}{5}$ or $\frac{5}{6}$? $\frac{4}{9}$ or $\frac{5}{11}$? $\frac{15}{16}$ or $\frac{17}{18}$? $\frac{7}{14}$ or $\frac{14}{28}$?

$\frac{2}{3}$ or $\frac{5}{10}$? $\frac{3}{4}$ or $\frac{2}{3}$? $\frac{20}{21}$ or $\frac{25}{26}$?
$\frac{6}{12}$ or $\frac{5}{10}$? $\frac{1}{2}$ or $\frac{3}{4}$? $\frac{6}{9}$ or $\frac{10}{12}$?

76. Perform the following:

$125 \times 3\frac{1}{2} =$ $42 - \frac{9}{10} =$
$64\frac{3}{4} \div 3 =$ $8 - 3\frac{2}{3} =$
$1\frac{1}{2} + \frac{3}{4} + \frac{6}{7} + 4 + 8\frac{1}{2} =$ $5 \times \frac{6}{11} =$
$\frac{3}{4}$ of $\frac{4}{7}$ of $\frac{14}{15} =$ $5 \div \frac{6}{11} =$
$\frac{3}{7} - \frac{1}{6} =$ $\frac{3}{7}$ of $7 =$
$8\frac{3}{4} - 2\frac{1}{2} =$ $\frac{1}{2} + \frac{3}{9} =$
$\frac{4}{5} \times \frac{6}{13} =$ $\frac{1}{2} - \frac{1}{11} =$
$9\frac{2}{3} \times 4 =$ $10 - 6\frac{3}{4} =$
$342\frac{2}{7} \times 12 =$ $\frac{9}{10}$ of $20 =$
$\frac{6}{7} \div 4 =$ $1\frac{5}{8} - \frac{12}{15} =$
$\frac{6}{7} \times 4 =$ $\frac{3}{4}$ of $\frac{6}{7}$ of $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{5}{9}$ of $\frac{3}{5} =$?

* * *

LESSON XIII.

COMPLEX FRACTIONS.

1. Every fraction is an expression of division, the numerator being the dividend and the denominator the divisor.

2. $\frac{1}{2}$ indicates that 1 is divided by 2. Illustrate that statement.

3. $\frac{1}{3}$ indicates that 1 is divided by 3. Illustrate.

4. $\frac{6}{3}$ indicates that 6 is divided by 3.

5. $\frac{\frac{1}{2}}{\frac{1}{2}}$ indicates that $\frac{1}{2}$ is divided by $\frac{1}{2}$.

6. $\frac{\frac{1}{2}}{\frac{1}{2}}$ is a complex fraction.

7. A complex fraction is a fraction which has either a fractional numerator or denominator, or both.

8. A complex fraction is reduced to a simple fraction by dividing its numerator by its denominator.

9. $\frac{\frac{1}{2}}{\frac{1}{2}}$ is reduced by dividing $\frac{1}{2}$ by $\frac{1}{2}$. $\frac{1}{2} \div \frac{1}{2} = 1$.

10. Reduce $\frac{\frac{2}{4}}{\frac{1}{2}}$ to a simple fraction.

11. Reduce $\frac{\frac{6}{4}}{\frac{1}{2}}$ to a simple fraction.

12. Reduce $\frac{1\frac{1}{2}}{2\frac{1}{2}}$ to a simple fraction. $1\frac{1}{2} = \frac{3}{2}$. $2\frac{1}{2} = \frac{5}{2}$. $\frac{3}{2} \div \frac{5}{2} = \frac{6}{10} = \frac{3}{5}$. *Answer.*

13. Reduce to simple fractions:

$\frac{\frac{9}{16}}{2}$; $\frac{12}{2\frac{1}{2}}$; $\frac{\frac{3}{7}}{1\frac{3}{4}}$; $\frac{\frac{2}{3}}{1\frac{3}{4}}$; $\frac{\frac{4}{11}}{6}$; $\frac{\frac{3}{5}}{3\frac{1}{2}}$; $\frac{1}{\frac{1}{2}}$; $\frac{6}{6\frac{2}{3}}$; $\frac{\frac{9}{2}}{1}$; $\frac{\frac{6}{7}}{3\frac{1}{2}}$.

14. Write a complex fraction.

15. Reduce twenty complex fractions to simple fractions.

LESSON XIV.

1. What must be paid for ½ yard of crape at 3½ dollars a yard?

2. Dayton had 6 dozens of eggs, ¾ of which he sold at 20 cents a dozen; how much did he get for his eggs?

3. Mrs. Gray's family ate 1 pie for dinner on

Monday, 1½ pies on Tuesday, and 1¼ pies on Wednesday. How many pies did they eat in the three days?

4. If they should eat 7 pies during the week, what would be the daily average?

5. How many acres would Mr. Carsley plough in a week, at a daily average of ½ acre?

6. What fraction of a dollar is 10 cents? Is 1 cent? Is 25 cents? Is 50 cents? Is 75 cents? Is 90 cents?

7. How many books can be bought for $25 when 3 books can be bought for 1 dollar?

8. If one book costs ⅛ of a dollar, how many books can be bought for $25?

9. Make and solve three problems similar to the above.

10. Carolyn had 10 daffodils, and gave 5 of them to Ruth; what fraction of the flowers did she keep for herself?

11. Write and solve two problems similar to the last.

12. If 21½ yards of silk for Katy's dress cost $50.50, how much would have to be paid for another half yard?

13. Write and solve another problem similar to the last.

14. When potatoes are worth $\frac{7}{10}$ dollars a bushel, how much would 100 bushels bring? How many bushels could be bought for $5?

15. What is a peck of oats worth at $1¼ a bushel?

16. What part of a bushel is 1 peck?

17. Mr. Wainwright bought a farm for $10,000, and sold it for ¾ what he gave for it. For how much did he sell the farm?

18. He received ½ of his pay down, and took a note for the remainder. For how much was the note given?

19. What is ½ of ¾ of 10000?

20. Mr. Green sold ¼ of a cheese to Mrs. Frost, ¼ to Mr. Wheeler, and ½ of the remainder to Mrs. Marsh. What part of the cheese was left, and how much did that which was sold bring at 8¾ cents a pound, the whole cheese weighing 48 pounds?

21. Write and solve two problems similar to the last.

22. William spent ½ of his money for a drum, ⅕ for candy, 1/10 for marbles, and had 40 cents left. How much money had he?

23. Write and solve 10 problems similar to the last.

24. ½ of 10 is ¼ of what number? ⅛ of 9 is 1/10 of what number?

25. Add ½ of ¾ to ⅔ of 9.

26. If a horse travels 1/10 of a mile in one minute, how many miles would he travel in one hour?

27. How many square rods of land in a field which is 105½ rods long and 75¾ rods wide?

28. Divide 25 by 6/7.

29. Mr. Brown left 1000 railroad shares to be divided among his heirs. Mrs. Brown received ½ the whole number, the eldest son ¾ of the remainder, the youngest son 1/10 of the whole, and the rest were divided equally among five grandchildren. How many shares did each receive? How much are Mrs. Brown's 500 shares worth at $85 per share?

30. Write and perform a similar problem to the last.

31. What will a gallon of milk cost at $3\frac{1}{2}$ cents a pint?

32. Write and solve ten examples something like the preceding one.

33. Reduce $\frac{6\frac{1}{3}}{9\frac{4}{5}}$ to a simple form.

34. $\frac{1}{5}$ of 15 is $\frac{1}{6}$ of what number?

35. $\frac{1}{4}$ of 28 is $\frac{1}{5}$ of what number? $\frac{1}{6}$ of 30 is what part of 40? $\frac{1}{8}$ of 96 is $\frac{1}{2}$ of what number? $\frac{1}{8}$ of 96 is what part of 72? $\frac{1}{25}$ of 100 is what part of 500? $\frac{1}{3}$ of 75 is $\frac{1}{10}$ of what number?

36. What part of 8 is 7?

37. Sammie had 8 oranges, and gave 7 of them to his playmates. What part did he keep for himself?

38. What part of 8 is 1? is 7?

39. Write and solve a problem similar to the last.

$\frac{3}{4}$ of 12 is $\frac{3}{7}$ of what number?

Solution. $\frac{1}{4}$ of 12 is 3, $\frac{3}{4}$ is 3 times 3, which is 9. If 9 is $\frac{3}{7}$ of some number, $\frac{1}{7}$ of that number is $\frac{1}{3}$ of 9, which is 3, and $\frac{7}{7}$, or the whole number, is 7 times 3, which is 21; hence, $\frac{3}{4}$ of 12 is $\frac{3}{7}$ of 21.

40. $\frac{1}{2}$ of 20 is $\frac{2}{3}$ of what number? Write out the solution.

41. $\frac{6}{7}$ of 14 is $\frac{2}{10}$ of what number?

42. What will 19 rolls of wall-paper cost at $\frac{5}{8}$ of a dollar a roll?

43. What part of 5 is $2\frac{1}{2}$?

44. What part of 7 is $3\frac{1}{2}$?

45. What part of 5 is $1\frac{1}{4}$?

46. What part of 10 is $2\frac{1}{2}$?

47. What fractional part of a common year is the month of August?

48. What fractional part of leap year is February?

49. Can $\frac{29}{366}$ be reduced to lower terms?

50. Is 29 prime or composite?

51. Is it possible to reduce to lower terms a fraction, one term of which is a prime number?

52. Write 10 fractions which cannot be reduced to lower terms.

53. Write 10 fractions which can be reduced, and reduce them to lower terms.

54. $\frac{1}{3}$ of Nettie's chickens are in the hen-house, 5 are with the old hen in the hen-coop, and the other brood, which is $\frac{1}{2}$ of the whole number, are old enough to be out by themselves. How many chickens has Nettie? What will $\frac{1}{2}$ of Nettie's chickens bring at $62\frac{1}{2}$ cents apiece?

SECTION III. — DECIMAL FRACTIONS.

LESSON I.

1. What is a fraction called which has its numerator written above, and its denominator written below, a horizonal line?

2. What is a fraction called which has only its numerator written, its denominator being indicated by a decimal point?

3. Is $\frac{1}{2}$ a common fraction or a decimal fraction?

4. Is .5 (five-tenths) a common fraction or a decimal fraction?

5. What is a decimal fraction?

6. What is a common fraction?

7. Is the decimal point a period or a comma?

8. What is a fraction?

9. Does a fraction always have a denominator?

10. What is the denominator of the fraction .2 (two-tenths)?

11. What is the numerator?

12. What is the denominator of the fraction .9 (nine-tenths)? .6 (six-tenths)?

13. What is the denominator of any fraction which occupies the first place on the right of the decimal point?

14. Write in words the fractions .2, .6, .8, .1.

15. Write the above as common fractions.

16. Write the common fractions $\frac{2}{10}$, $\frac{4}{10}$, $\frac{9}{10}$, $\frac{7}{10}$, as decimal fractions.

17. What is the first place to the right of the decimal point?

18. What is the second place to the right of the decimal point?

19. What is the denominator of a fraction which occupies two places to the right of the decimal point?

20. What is the denominator of the fraction .25? of .16? of .31? of .06? of .11? .1? of .6? of $\frac{3}{10}$? of $\frac{7}{100}$? of .01? of $\frac{1}{10}$? of $\frac{1}{100}$?

21. What is the comparative value of .5 and $\frac{5}{10}$? of $\frac{25}{100}$ and .25?

22. What is the denomination of the third place to the right of the decimal point?

23. Which are smaller, thousandths or tenths?

24. Tenths or hundredths?

25. Hundredths or thousandths?

26. Thousandths or ten-thousandths?

27. How many places to the right of the decimal point is ten-thousandths? is hundredths? is hundred-thousandths? is millionths? is ten-millionths?

28. Is hundred-millionths a large or a small fraction?

29. Could you measure the one hundred-millionth part of an inch?

30. Draw a line an inch long.

31. Into how many parts would you have to divide the line to get one hundred-millionth of it?

32. Have we any instrument delicate enough to divide an inch into a hundred million parts?

33. Could we see anything so small?

34. Can you imagine anything so small?

35. Which is most, .2 of a cent or .009?

36. How many one hundred-millionths would it take to make .009?

37. Write one hundred-millionth in figures.

38. Which is more, .2 or .25?

39. Which is more, .2 or .20?

40. Which is more, .1 or .099?

41. How many cents is .2 of a dollar?

42. How many cents in .25 of a dollar? in .5 of a dollar? in .05 of a dollar? in .01 of a dollar?

43. Write a decimal fraction of the denomination of tenths, and then write the same as a common fraction; of hundredths; of millionths; of thousandths; of ten-thousandths; of ten-millionths; of hundred-thousandths; of hundred-millionths; of trillionths.

44. What is a decimal fraction?

45. What is a common fraction?

46. What is a fraction?

47. What is a mixed number?

48. Is $\frac{1}{2}$ a mixed number? is $3\frac{1}{2}$? is 5? is 1.5? is 3.35? is .52?

49. Write a mixed number with a common fraction; with a decimal fraction.

50. Write the mixed number 3.7 with a common fraction.

LESSON II.

1. Which is most, $1\frac{5}{10}$ or 1.5 or $\frac{15}{10}$?

2. Reduce the mixed number $3\frac{5}{10}$ to an improper fraction.

3. Reduce the mixed number 3.5 to an improper fraction, and compare their relative value.

4. Write ten mixed numbers with decimals, and reduce them to mixed numbers with common fractions.

5. Write ten mixed numbers with common fractions, and reduce them to decimals.

6. A decimal fraction can always be reduced to a common fraction by writing ten, or a multiple of ten, for its denominator.

7. Can a common fraction which does not have ten or a multiple of ten be always as readily reduced to a decimal?

8. How is a common fraction reduced to a decimal?

9. Can most common fractions be reduced to exact decimals? Can all?

10. When can a common fraction be reduced to a decimal?

11. In reducing $\frac{1}{2}$ to a decimal, how many ciphers do you add to 1 before dividing by 2?

12. In the fraction $\frac{1}{25}$ how many ciphers do you add to 1 before dividing by 25?

13. How do you know the number of decimal places which the answer should have?

14. In reducing the common fraction $\frac{1}{4}$, thus,

$$\begin{array}{l} 1 \\ \overline{4}\underline{)1.00} \\ \quad\ .25 \end{array}$$

where should the decimal point be placed? Why?

Answer. The decimal point must be placed before 2 because there must be as many places pointed off in the decimal as the number of ciphers which are added to the numerator.

15. In the reduction of the fraction $\frac{12}{24}$, thus,

$$\begin{array}{l} \underline{12} \\ 24\overline{)\underline{12.0}} \\ \qquad .5 \end{array}$$

how many places in the decimal?

16. In the reduction of $\frac{1}{8}$, thus,

$$\begin{array}{l} \underline{1} \\ 8\overline{)\underline{1.000}} \\ \quad\ .125 \end{array}$$

how many ciphers were added?

17. Then how many places in the decimal?

18. In the reduction of $\frac{1}{125}$, thus,

$$\begin{array}{l} \underline{1} \\ 125\overline{)\underline{1.000}} \\ \qquad\ .008 \end{array}$$

how many ciphers were added to the numerator?

19. Then, if three ciphers were added to the numerator, and you have but one figure in the quotient, how can you have that figure in the third place from the decimal point?

20. How many ciphers do you place before 8? Are $\frac{1}{125}$ and .008 of the same value?

21. Reduce .008 back to the common fraction $\frac{1}{125}$; thus,

$$.008=\frac{8}{1000}\qquad 8\,\Big|\,\frac{8}{1000}=\frac{1}{125}.$$

22. Reduce the following common fractions to decimals, and back to the original fractions: $\frac{1}{2}$, thus,

$$\begin{array}{l}\frac{1}{2}\!\!\underline{)10}\\ \quad\;\; .5\end{array} \qquad .5=\frac{5}{10} \qquad 5\,\Big|\,\frac{5}{10}=\frac{1}{2}.$$

$\frac{3}{4}$; $\frac{4}{5}$; $\frac{2}{5}$; $\frac{1}{4}$; $\frac{5}{8}$; $\frac{3}{15}$; $\frac{4}{125}$; $\frac{7}{8}$; $\frac{5}{8}$; $\frac{1}{25}$.

23. Reduce the following decimals to common fractions, and back to decimals: .04; .005; .5; .125; .01; .75; .025; .25; .2; .02; .002; .0005.

24. Can all decimal fractions be reduced to common fractions?

25. Can all common fractions be reduced to exact decimals?

Why not? *Answer.* Because sometimes the denominator is not contained in the numerator, with any number of ciphers annexed, without a remainder.

26. Reduce $\frac{1}{3}$ to a decimal; thus,

$$\begin{array}{l}\frac{1}{3}\!\!\underline{)100000}\\ \quad\;\; .33333\end{array}$$

27. Could this be divided far enough to get no remainder?

28. Would there be a succession of 3's indefinitely?

29. Reduce $\frac{1}{6}$ in the same manner.

30. Would there be a succession of 6's to infinity?

31. Reduce $\frac{1}{9}$; $\frac{1}{12}$; $\frac{4}{11}$.

32. What is infinitely repeated above?

33. Reduce $\frac{8}{9}$; what is repeated continuously?

34. Reduce $\frac{8}{11}$; what is repeated?

35. Reduce $\frac{5}{67}$; what is repeated?

36. Reduce $\frac{1}{24}$; what is repeated?

37. Reduce $\frac{3}{49}$; does this produce a repetend?

38. When a repetend is produced, what is the decimal called? *Answer.* When a repetend is produced, it is called an infinite or circulating decimal.

39. Does the reduction of $\frac{1}{2}$ to a decimal produce an infinite or circulating decimal?

40. What is a circulating decimal?

41. How is a circulating decimal reduced to a common fraction?

42. Does the fraction $\frac{1}{3}$ produce a circulating decimal? What is it?

43. If $.\dot{3}\dot{3}\dot{3}\dot{3}$ is the decimal, then 3 is repeated, and $\frac{3}{9}$ would be the common fraction, which, reduced to its lowest terms, would be $\frac{1}{3}$.

◆

LESSON III.

1. Which are more easily used, decimal fractions or common fractions?

2. How do you add decimals?

3. Write a rule for the addition of decimals.

4. Write a rule for the subtraction of decimals.

5. Subtract .135 from .5; .64 from 1.25; 8.6 from 24; .136 from .647; 9.25 from 100.

6. Perform all the examples in your Arithmetic under addition and subtraction of decimals.

7. Give the rule for multiplying decimals.

8. How many places must the product have?

9. If .01 is multiplied by .2, how many places in the product?

10. If there are not enough significant figures, where are ciphers placed?

11. Multiply .003 by .9; .003 by 9; .003 by .09; 125 by .005; 6.42 by 7.5; 36 by 8.25; .47 by .008.

12. Perform all the examples in your Common School Arithmetic under Multiplication of Decimals.

13. Give the rule for the division of decimals.

14. How many places are pointed off in the quotient?

15. Must the dividend always have as many places as the divisor before the quotient can be properly pointed off?

16. If the dividend does not contain as many places as the divisor, how must the deficiency be supplied?

17. Are ciphers prefixed or annexed to the dividend?

18. If there are not places enough in the product after multiplying, are ciphers prefixed or annexed?

19. If there are not enough places in the dividend, are ciphers prefixed or annexed?

20. Perform all the examples in your Arithmetic under Division of Decimals.

21. Divide 8 by .2.

22. Is the answer 40, .4, or .04?

23. Divide 12 by .2.

24. Is the answer 60, 6, .06, .6, or .006?

25. Divide 20 by .5.

26. Is the answer 40, 4, .4, or .04?

27. How many ciphers did you add to the dividend?

28. Why did you add one cipher?

29. Divide .12 by .2, and prove it.

30. Divide 1.2 by .2, and prove it.

1.2 by 2.
12 by .02.
12 by .2.
.12 by .02.
1.2 by .02.
20 by 5.
20 by .5.
20 by .05.
24 by .06.
24 by .6.
.24 by .6.
2.4 by .6.
2.4 by .06.
24 by 6.
364 by .02.
86.4 by .4.
1000 by .25.
10.5 by 5.

LESSON IV.

1. What effect on the value of a decimal has a cipher annexed to its right? Illustrate.

2. What effect on the value of a decimal has a cipher placed between the decimal and the decimal point? Illustrate.

3. Subtract a decimal containing four places from a decimal containing only one place; for example, .3671 from .8.

4. How many ciphers must be annexed to .8?

5. Write in words .8000, .800, .80, .8.

6. Express in decimals: sixteen hundredths; nine hundredths; six-tenths; one hundred and ten ten-thousandths; thirty-seven millionths; three *and* twenty-eight hundredths; one hundred *and* sixty-five hundred-thousandths.

7. Write in words .006, .07, 123.46, 49.00001, .00375, 12.139, 67.48, 290.0061.

8. Multiply 4.6 by 10. 4.6 by 10 = 46.

9. To multiply a decimal by 1 with any number of ciphers, move the decimal point in the multiplicand as many places to the right as there are ciphers in the multiplier.

10. Multiply:

3.6 by 100. 6.403 by 10. 8.64 by 100.
4.78 by 100. 890.01 by 1000. 1.301 by 10000.

11. When decimals are added, how many places are pointed off in the sum? Illustrate.

12. When decimals are subtracted, how many places are pointed off in the remainder? Illustrate.

13. When decimals are multiplied, how many places are pointed off in the product? Illustrate.

14. Divide 7.5 by 10. 7.5 by 10 = .75.

15. To divide a decimal by 1 with any number of ciphers, move the decimal point in the dividend as many places to the *left* as there are ciphers in the divisor.

16. Divide 36.7 by 100. 36.7 by 100 = .367.

17. Reduce 36.7 to a common fraction, and divide it by 100.

$$36.7 = \frac{367}{10} \div 100 = \frac{367}{1000})\underline{367.000}$$

.367 *Answer.*

18. When decimals are divided, how many places are pointed off in the quotient? Illustrate.

19. If there are ten decimal places in the dividend and seven decimal places in the divisor, how many places must there be in the quotient? Illustrate.

20. If there are four decimal places in the dividend and four decimal places in the divisor, how many decimal places will there be in the quotient? Illustrate.

21. If there are two decimal places in the multiplicand and one decimal place in the multiplier, how many decimal places are there in the product? Illustrate.

22. If there are five decimal places in the dividend and none in the divisor, how many will there be in the quotient? Illustrate.

23. If there are four decimal places in the dividend and six in the divisor, what must be done before the division can be performed?

24. If you are to divide .1364 by .000682, how many ciphers must be annexed to the dividend?

25. How many decimal places in the quotient?

26. Which is larger, .1364 or .000682?

27. How many times larger is .1364 than .000682?

28. If then .1364 is 200 times larger than .000682, how many times will .000682 go in .1364?

29. How many times will .002 go in 12?

30. How many times will .002 go in .012?

31. How many times will .002 go in .12?

32. How many times will .02 go in .12?

33. How many times will .02 go in .000012?

34. How many times will .2 go in 12? in 1.2? in 120? in .012? in .0012? in .12? in .00012? in 1200? in .000012?

35. Multiply a decimal of two places by a number containing one decimal place.

36. Multiply a number containing six places, three of which are decimals, by a number containing two places, one of which is a decimal.

37. What is the product of .8 multiplied by .8?

.09 by .9? .007 by .007? .06 by .006? .012 by .00012? .5 by .05?

38. Multiply the following, and prove by division: 60 by .6; 800 by 9; .64 by .02; .45 by 3; .09 by .009.

LESSON V.

1. Reduce 1 inch to the decimal of a yard.

1 inch = $\frac{1}{36}$ of a yard.

$$\begin{array}{r} 1 \\ \hline 36)\underline{1.000} \\ .027 \end{array}$$

1 inch is .027 of a yard.

2. Reduce $\frac{1}{2}$ inch to the decimal of a yard.

$\frac{1}{2}$ of $\frac{1}{36} = \frac{1}{72}$.

$$\begin{array}{r} 1 \\ \hline 72)\underline{1.000} \\ .013 \end{array}$$

$\frac{1}{2}$ inch is .013 of a yard.

3. Reduce 1 quart to the decimal of a gallon.

1 quart is $\frac{1}{4}$ of a gallon, and $\frac{1}{4}$ reduced to a decimal is .25. 1 quart is .25 of a gallon.

4. Reduce 1 pint to the decimal of a quart.

5. Reduce 1 pint to the decimal of a gallon.

6. Reduce 1 pint to the decimal of a peck.

7. What fraction of 1 bushel is 1 pint?

8. Reduce $\frac{1}{64}$ of a bushel to a decimal.

9. How many quarts in .75 of a gallon? $.75 = \frac{75}{100}$ of a gallon, reduced to quarts, equals $\frac{300}{100}$ quarts, which is 3 quarts.

$$.75 \times 4 = \frac{75}{100} \times 4 = \frac{3\cancel{0}\cancel{0}}{1\cancel{0}\cancel{0}}\Big) = 3 \text{ quarts.}$$

10. How many inches in .083 of a yard?

11. Reduce 6 inches to the decimal of a yard.

12. Reduce 18 inches to the decimal of a yard. $\frac{18}{36}=\frac{1}{2}=.5$ of a yard.

13. Reduce 30 minutes to the decimal of an hour.

14. Reduce 15 minutes to the decimal of an hour.

15. Reduce .75 of an hour to minutes.

16. Reduce ½ dollar to cents.

17. Reduce 5 cents to the decimal of a dollar.

18. How many rods in .5 of a mile?

19. How many ounces in .5 of a pound Troy?

20. Reduce 12 ounces Avoirdupois to the decimal of a pound.

21. Reduce ½ foot to the decimal of a yard.

22. Reduce 1 foot to the decimal of a rod.

$$\frac{1}{16\frac{1}{2}}=\frac{1}{\frac{33}{2}}=1\div\frac{33}{2}=\frac{2}{33})2.00(.0606,\text{ or. }\dot{0}\dot{6}$$

$$\begin{array}{r} \underline{198}\\ 200\\ \underline{198}\\ 2 \end{array}$$

23. Reduce $.\dot{0}\dot{6}$ of a rod to feet.

24. Reduce 1 gill to the decimal of a pint.

25. Reduce 2 gills to the decimal of a quart.

26. How many cord-feet in .25 of a cord of wood?

27. Add together .5 of an acre, 1 rood, and 40 square rods.

28. Subtract .25 of a mile from 7 furlongs.

29. How many grains in .5 of a dram?

30. Add .75 and ¾ miles.

31. Which is most, ½ mile, 5 furlongs, or .5 of a mile?

32. How many lots containing 40 square rods each are there in .75 of an acre? Illustrate with a drawing.

33. How many lots containing 20 square rods each are there in $\frac{1}{2}$ acre?

34. Write and perform two problems similar to the last.

35. How many quart bottles can be filled from a cask containing 9.75 gallons?

36. Write and perform another problem similar to the above.

37. What will one hundred cans of corn cost at one and twenty-five hundredths dollars a dozen?

38. Reduce 7 fur. 20 rd. to the decimal of a mile.

39. Reduce the decimal of a mile back to furlongs and rods.

40. If .5 of a cord of wood cost $4.50, what will 10 cords cost?

41. If $\frac{7}{8}$ of a cord of wood cost $7.00, what will .5 of a cord cost?

42. Which will be more convenient in the solution of the last problem, to learn what one cord will cost, or to reduce .5 to eighths?

43. Write and perform a problem similar to the last.

44. Reduce 15*s.* 8*d.* to the fraction of a pound.

45. Reduce .775 of a mile to furlongs and rods.

46. What will 15 gal. 3 qt. 1 pt. of vinegar cost at 0.37\frac{1}{2}$ a gallon?

47. Write and perform another problem similar to the last.

48. What will 10.75 cords of wood cost at $7.62½ a cord?

49. Write and perform five problems similar to the last.

50. Divide twenty-four by twelve hundred-thousandths.

51. Multiply nine-tenths by three-hundredths.

52. Subtract two thousand one hundred and two ten-thousandths from eighty-nine hundredths.

53. Divide .25 by .25; 25 by .25; .25 by 25. Prove the above by multiplication.

54. From five and seven-tenths take one and nineteen one-hundredths.

55. Reduce $.09\dot{3}$ to a common fraction.

56. If an ounce of gold is worth $25, what is the value of .3 of a pound?

57. In a school of 40 scholars .6 of the number are boys; how many are girls?

LESSON VI.

1. What is .7 of 70? of 20? of 60? of 100?

2. What decimal part of 4 is 2? of 10 is 5? of 100 is 50?

3. What decimal part of 4 is 1?

4. 3 is what decimal part of 4?

5. Which is greater, .7 or .71?

6. Which is greater, .1 or .09?

7. Mr. James has a piece of work which it will take him 20 days to do alone; how many men must he get to help him in order to do the work in 2 days?

8. What decimal part of the work does he do himself?

9. How many days' work does he do?

10. Write and perform a problem similar to the above.

11. Mr. Mason set a tub which held 15 gallons under the eaves. Into this tub there ran on an average 2.4 gallons an hour; how many hours were required to fill the tub?

12. Reduce the fraction of an hour in the above answer to minutes.

13. Write and perform another similar problem.

14. A train leaves Boston at 6 P.M., and arrives in Chicago at 6 A.M. on the second morning. If the train averages 30.5 miles an hour, how many miles is it from Boston to Chicago?

15. Write and perform five problems similar to the above.

16. How many feet high is a monument which has 300 steps to the upper landing, averaging .75 of a foot in height, and which is 20 feet above the upper landing?

17. Write and perform a problem similar to the above.

18. Add 6.01, 4.00009, and 125.

19. Write in words 265.03709.

20. Reduce $\frac{5}{17}$ to a decimal, and back to $\frac{5}{17}$.

21. How many square feet in a rectangle 106.5 feet long by 80.36 feet wide?

22. Mr. Baker's building lot contains .25 of an acre. The buildings cover one-half the lot. How many square feet of grounds are there about Mr. Baker's place?

23. You have learned that the circumference of a circle is *about* 3 times as great as the diameter. It is more nearly accurate to say that it is 3.1416 times as great. What, then, is the circumference of a circle 3.5 feet in diameter?

24. If the circumference of a circle be multiplied by .31831, the product is the diameter.

25. What is the diameter of a circle which is 11 feet in circumference?

26. How many yards of carpeting are required to cover a floor 14 feet long by 9 feet wide, if the carpeting is a yard wide? How many yards are required if the carpeting is only .75 of a yard in width?

27. How many square feet on the four walls of a room which is 10.5 feet long, 8 feet wide, and 10.1 feet high?

Allowing 220 square feet for doors, windows, wainscotting, and bordering, how many rolls of paper will it take to cover the walls, if the rolls are 2.4 feet wide and 18 yards long?

28. What will the paper cost at $1.62½ a roll? How many yards of bordering are required?

29. Write and perform a problem about the carpeting of your own sleeping-room. You can easily measure the floor.

30. Write a problem about the carpeting of the church vestry.

31. Your teacher will give you more problems from some other arithmetic.

SECTION IV. — COMPOUND NUMBERS.

LESSON I.

1. What is a number?

2. Give an abstract number; a concrete number.

3. A collection of units of a single denomination, either abstract or concrete, is a simple number.

4. A collection of concrete units of several denominations taken collectively is a compound number.

5. Is 10 books simple or compound?

6. Is 3 simple or compound?

7. Is 2 pints and 3 gills simple or compound? 6 dogs? 4 dogs and 1 dog? 3 pens and 7 pens? 1 yard 2 feet and 4 inches? 4 boys and 6 girls?

8. Give two simple numbers; two compound numbers.

9. Give two simple concrete numbers.

10. Give two simple abstract numbers.

11. Can compound numbers be abstract?

12. What is a simple number?

13. What is a compound number?

14. Is "1 mile and 5 furlongs" simple or compound? 5? 3 men? 1 cow and 2 calves? 1 pound and 2 ounces?

15. Is 3 books a denominate number? Why not?

16. What is a denominate number?

17. Must all compound numbers be denominate?

18. Could you add 2 feet, 6 inches and 4 inches together?

19. Are 2 feet and 6 inches of the same denomination? Are they of the same kind? *Answer.* They are of the same kind, each being a measure of length.

20. How many inches in 2 feet?

21. Can you add together 24 inches, 6 inches, and 4 inches?

22. The process of changing compound numbers to different denominations is called the Reduction of Compound Numbers.

23. What is the scale between the different units of simple numbers, that is, how many units make one ten, etc.?

24. Do all simple numbers have the uniform scale of ten?

25. Do compound numbers have a uniform or a varying scale?

26. Do the units of United States money vary in a uniform scale?

27. What is the scale by which the different units of United States money vary?

28. Can operations be performed upon the units of United States money the same as upon those of simple numbers? Why so?

29. Can operations be performed upon the different denominations of other compound numbers the same as upon simple numbers? Why not?

30. We do not usually consider the denominations of United States money compound, because they have a uniform scale of 10 the same as simple numbers.

31. Have the denominations of time measure a uniform scale of 10?

32. Have the denominations of 364832 a uniform scale of 10?

33. What are the denominations of 364832? *Answer.* They are units, tens, hundreds, thousands, tens of thousands, and hundreds of thousands.

34. What are the denominations of 2 bushels 3 pecks and 1 quart? *Answer.* They are bushels, pecks, and quarts.

35. What are the denominations of 137? of 1 day and 5 hours? of 10 cords and 3 cord-feet? of 6 ounces and 1 dram?

36. Why is 147 a simple number? *Answer.* 147 is a simple number because its denominations have a uniform scale of 10.

37. What are the denominations of 147?

38. Why is "1 acre and 1 rood" a compound number?

39. Why is "3 books" a concrete number?

40. Why is 3 an abstract number?

41. Why is 1 key a concrete number?

42. Why is 3 pecks 5 quarts and 1 pint a compound number?

43. What is Reduction of Compound Numbers?

LESSON II.

ENGLISH MONEY AND OTHER MONEY.

1. Give the table for United States money. For *English* money.

2. Can operations be performed upon English money in the same manner as upon United States money and upon simple numbers?

3. Could you multiply 3 dollars and 12 cents by 2, the same as you would multiply 312 by 2?

4. Could you multiply £3 1*s.* 2*d.* by 2 in the same manner as you would multiply 312 by 2?

5. What is first to be done in order to multiply £3 1*s.* 2*d.* by 2? *Answer.* The pounds, shillings, and pence may by reduced to pence; thus,

$$\begin{array}{r l} \pounds 3 & 1s.\ 2d. \\ \underline{20} & \\ 60 & \\ \underline{1} & \\ 61 & \text{shillings.} \\ \underline{12} & \\ 732 & \\ \underline{2} & \\ 734 & \text{pence.} \end{array}$$

Why is 3 multiplied by 20? Why is 1 added to 60? Why is 61 multiplied by 12? Why is 2 added to 732?

6. How many pence are there in £3 1*s.* 2*d.*? Now multiply 734*d.* by 2.

7. Reduce 1468 pence to pounds, shillings, and pence.

$$\begin{array}{l} 12\overline{)1468}\ \text{pence} \\ 20\overline{)122} - 4\,d. \\ \quad\ \ 6 - 2 = \pounds 6\ 2s.\ 4d. \end{array}$$

Why is 1468 divided by 12? What is 122? Why is 122 divided by 20? What is 6? What is 2?

Which is greater, £6 2*s*. 4*d*. or 1468 pence? Which is greater, £6 2*s*. 4*d*. or 122 shillings? By what have you multiplied £3 1*s*. 2*d*. to get £6 2*s*. 4*d*.?

8. Reduce £10 5*s*. 3*d*. to pence.

9. Reduce £20 to shillings.

10. Reduce 400*s*. to pounds.

11. Which is the highest denomination, pounds, shillings, or pence?

12. Reducing numbers from a higher to a lower denomination is Reduction Descending.

13. Reducing numbers from a lower to a higher denomination is Reduction Ascending.

14. Is the reduction of £3 1*s*. 2*d*. to pence, reduction ascending or reduction descending?

15. Is the reduction of 1464 pence to pounds and shillings, reduction ascending or reduction descending?

16. Is the *value* of a compound number changed in reducing it from one denomination to another?

17. Reduce 2 pounds to shillings.

18. Which is greater, 2 pounds or 40 shillings?

19. Reduce 100 shillings to pounds.

20. Which is greater, 100 shillings or 5 pounds?

21. Which is greater, 2 pounds sterling or 30 shillings?

22. Can you subtract 30 shillings from 2 pounds without first reducing 2 pounds to shillings?

23. Subtract 9 pence from 1 pound.

24. Reduce 1 pound to pence, and subtract 9 pence.

25. Have you ever seen any English coin?

26. What English coin is of about the same value as our 25-cent piece?

27. If an English shilling is worth one of our quarters, how many shillings are equal in value to one dollar?

28. How many of our dollars would equal a pound sterling?

29. Have you seen a five-dollar gold-piece?

30. There is an English gold-piece worth one pound sterling; what is it called?

31. How many shillings in a sovereign?

32. A guinea has one more shilling than a sovereign; how many shillings make a guinea?

33. Sometimes a pound sterling is worth more than 5 dollars and sometimes less than 5 dollars. The exchange is not fixed, and you must learn at the bankers just what it is.

34. If you had just landed from the steamer at Portland, Maine, with a bill of exchange for 175 pounds, and should take your bill to J. B. Brown's banking house, and learn that the exchange was $4.90 for a pound sterling, how many dollars would you get for your 175 pounds?

35. Should you take United States money to England?

36. What would your American banker give you for your money?

37. What would you do with your bill of exchange in England?

38. Would you get a bill of exchange if you were going to New York or Chicago with a large sum which you did not wish to carry in money?

39. Did you ever see a draft?

40. Do you get a draft or check at the banker's or at a bank?

41. Could you get a bill of exchange on England at the bank?

42. Could you get a draft on New York at the banker's?

43. What is the paper called which you would get of a bank for money deposited there, and which you would present in another city where you wished to use your money?

44. What is the paper called which you would buy of a banker to take abroad, in order to draw money on a foreign banker?

45. If the exchange were just $5.00 per pound sterling, how many pounds would you draw on a London banker for a bill of exchange, for which you paid $1000.00 in New York City?

46. What would a bill of exchange for $2000.00 bring in English money with the exchange at $4.85?

47. What would a bill of exchange for 100 pounds be worth in Boston when the exchange was $5.55?

48. What is the English one-pound coin called?

49. About how much is it worth in United States money?

50. What is our five-dollar gold-piece called?

51. Is the English guinea coined now?

52. How many shillings in a guinea?

53. How many shillings in a sovereign?

54. How many quarters in a five-dollar gold-piece?

55. How many pence in a shilling?

56. How many cents in a quarter of a dollar?

57. What is the value of an English penny in cents?

58. The English also have a half-penny, which they call *ha-penny.*

59. How much would this half-penny be worth in United States money?

60. The English twopence is called *teppence.* What is its value in cents?

61. The penny is made of dark metal, and looks like the old large cents which we used before our civil war.

62. The half-penny looks somewhat like our bronze two-cent piece.

63. The other English coins are made either of gold or silver.

64. The English threepence is called *threppence.* What is its value in our money?

65. What is the value of the sixpence?

66. Is French money the same as English?

67. Is it the same as United States money?

68. Is German money the same as ours? Is Italian?

69. Do you know of any country whose currency is the same as ours?

70. If you were going to travel in Europe, where could you learn the currency of different countries?

71. Find the tables of currency in your dictionary, and give the value of a French napoleon; of an Austrian ducat; of an English sovereign; of a United States eagle; of an English crown; of a French franc; of an English guinea.

72. What fractional part of a pound is 1 shilling? Is 10 shillings? Is 2 shillings? Is 3 shillings? Is 4 shillings? Is 5 shillings? Is 15 shillings?

73. How many pounds sterling in 60 shillings? In 40 shillings? In 30 shillings? In £9 10*s.*? *Answer.* In £9 10*s.* there are £9½.

74. How many pounds in £7 5*s.*?

75. How many shillings in £½? In £¾? In £¼?

76. How many pounds in £10 15*s.*?

77. How many pounds and shillings in £9¾? In £1½?

78. What fractional part of a shilling is 1*d.*? 2*d.*? 6*d.*?

79. Is there an English coin of the value of a farthing?

80. Is there a United States coin of the value of a mill?

81. What is the smallest English coin?

82. Does the word "smallest" refer here to size or to value?

83. What is the smallest United States coin?

84. What is the smallest coin in size you ever saw?

85. Perform all the examples in your Common School Arithmetic under English money.

LESSON III.

WEIGHTS.

1. Mention some articles which are bought and sold by weight.

2. Are all articles weighed by the same standard?

3. Mention something weighed by Avoirdupois Weight; by Apothecaries' Weight; by Troy Weight.

4. What weight is used in weighing groceries? gold? medicine? tobacco? hay? meat? candy? silver? powder and shot? jewels? wool?

5. Give the table for Avoirdupois Weight; for Troy Weight; for Apothecaries' Weight.

6. In which are both the pounds and the ounces the same?

7. The pound Avoirdupois equals 7000 grains, the pound Troy, 5760 grains, and the grains are the same in both.

8. How much heavier is the pound Avoirdupois than the pound Troy?

9. Which is heavier, an ounce Troy or an ounce Avoirdupois? *Answer*. The ounce Troy is heavier than the ounce Avoirdupois.

10. Which is heavier, a pound of coffee or a pound of gold?

11. A pound of coffee or a pound of tea?

12. A pound of sugar or a pound of opium?

13. What denomination is the same in all weights?

14. How many grains in a pound Troy? in a pound Avoirdupois? in an ounce Troy? in an ounce Avoirdupois? in an ounce Apothecaries' weight?

15. Perform all the examples in your arithmetic under these three tables.

16. Change 5 pounds Troy to pounds Avoirdupois.

17. How many pounds Avoirdupois in 20 pounds Troy?

18. How many ounces in 1 pound Troy?

19. What part of a pound Troy is 4 ounces? *Answer.* 4 ounces is $\frac{1}{3}$ of a pound Troy.

20. What part of a pound Troy is 6 ounces? is 12 ounces? is 2 ounces? is 1 ounce? is 3 ounces? is 5 ounces?

21. How many ounces in $\frac{1}{2}$ pound Troy? in $\frac{1}{3}$ pound? in $\frac{1}{4}$ pound? in $\frac{1}{6}$ pound? in $\frac{1}{12}$ pound?

22. How many pounds Troy in 100 pounds Avoirdupois?

23. How many ounces is a pound Avoirdupois?

24. What part of a pound Avoirdupois is 8 ounces? is 2 ounces? is 4 ounces? is 12 ounces?

25. How many ounces in $\frac{1}{2}$ pound Avoirdupois? in $\frac{1}{4}$ pound? in $\frac{3}{4}$ pound?

26. Reduce 3 lbs. 8 oz. 5 drs. 1 sc. 7 grs. to grains.

27. How many grains in 25 lbs. 3 oz. 2 drs. 2 scs. 5 grs.?

28. How many pounds in 12 cwt. 3 qrs. 10 lbs.?

29. How many pounds in a ton of hay?

30. Did you ever see a load of hay on the hay-scales?

31. Where are the Fairbanks' Scales made?

32. How many pounds in a hundred-weight of sugar?

33. How many drams in 1 T. 4 cwt. 3 qrs. 15 lbs. 11 oz. 4 drs.?

34. How many tons in 5644132 drams?

35. What part of 1 ton is 1000 pounds?

36. What part of 1 ton is 500 pounds?

37. If a ton of coal costs $8.00, what will $\frac{1}{4}$ of a ton cost?

38. If a ton of hay costs $12.00, what will $\frac{3}{4}$ of a ton cost?

39. How many pounds in $\frac{3}{4}$ of a ton?

40. What will $\frac{1}{2}$ a pound of tea cost at $1.50 a pound?

41. What will $1\frac{1}{2}$ pounds of coffee cost at 20 cents a pound?

42. What will a pound of candy cost at 3 cts. an ounce?

43. What will 4 ounces of cloves cost at 36 cts. a pound?

44. What will $\frac{1}{2}$ a pound of tobacco cost at 10 cts. an ounce?

45. What is $\frac{1}{16}$ of a pound Avoirdupois called? $\frac{1}{8}$? $\frac{3}{16}$? $\frac{5}{16}$?

46. Express $3\frac{1}{2}$ pounds Troy in pounds and ounces. $25\frac{2}{3}$ lbs.; $6\frac{1}{2}$ lbs. Avoirdupois; $9\frac{3}{4}$ lbs.; $7\frac{1}{2}$ lbs.

47. Which weight is used in weighing mail matter?

48. Which do the express companies use? The coal dealers? Which is used at the meat-markets? At the United States mints in weighing gold bullion?

49. How many ounces in $1\frac{3}{4}$ lbs. of rice? in $\frac{1}{2}$ lb. of alum? in $\frac{3}{16}$ lb. of camphor gum?

50. What would $\frac{3}{16}$ of a pound of camphor gum cost at 5 cts. an ounce?

51. Add 2 qrs. 17 lbs. 9 oz. and 3 qrs. 12 lbs. 13 oz.

qrs.	lbs.	oz.
2	17	9
3	12	13
6	5	6

9 ounces and 13 ounces are 22 ounces, which equals 1 pound and 6 ounces. 1 pound, 12 pounds, and 17 pounds equal 30 pounds, which is 1 quarter and 5 pounds. 1 quarter, 3 quarters, and 2 quarters equal 6 quarters.

52. In the same way add:

T.	cwt.	qrs.	lbs.	oz.	drs.
75	12	3	16	13	13
12	13	1	10	10	12
65	19	2	16	7	2
100	9	3	11	1	8

lbs.	oz.	drs.	grs.
15	10	11	22
75	8	13	17
13	7	12	11
29	9	16	13
47	11	14	6

53. Make for yourself and perform five similar examples in the addition of compound numbers.

54. Subtract 1 lb. 12 oz. 2 dr. from 20 lb. 8 oz. 4 dr.

lbs.	oz.	drs.
20	8	4
1	12	2
18	12	2

2 drams from 4 drams leaves 2 drams, 12 ounces from 24 ounces (1 lb. and 8 oz.) leaves 12 ounces, and 1 pound from 19 pounds leaves 18 pounds.

55. In the same way subtract the following:

£	*s.*	*d.*	*far.*
78	5	7	2
52	12	3	3

T.	cwt.	qrs.	lbs.	oz.
10	1	2	12	1
8	17	3	12	10

56. Make for yourself and perform five similar examples in the subtraction of compound numbers.

57. Multiply £3 5*s.* 8*d.* 1 *far.* by 2.

£	*s.*	*d.*	*far.*
3	5	8	1
			2
6	11	4	2

Twice 1 farthing is two farthings. Twice 8 penc are 16 pence, which is equal to 1 shilling and 4 pence Twice 5 shillings are 10 shillings, and 1 are 11 shillings; and twice 3 pounds are 6 pounds.

58. As above multiply:

T.	cwt.	qrs.	lbs.
1	35	1	18
			9

£	*s.*	*d.*	*far.*
25	18	8	2
			10

59. Make for yourself and perform five simila examples in the multiplication of compound numbers

60. Divide 20 lbs. 15 oz. 1 dr. by 3.

	lbs.	oz.	drs.
3)	20	15	1
	6	15	11

3 in 20 lbs., 6 times and 2 lbs. over; 2 lbs. = 32 oz. plus 15 oz. = 47 ounces. 3 in 47 ounces, 15 times an 2 ounces over. 2 ounces = 32 drams, plus 1 dram = 33 divided by 3 = 11.

61. As above divide:

	£	*s.*	*d.*
5)	125	9	6

	T.	cwt.	qrs.	lbs.
6)	100	10	3	12

62. Make for yourself and perform five simila examples in the division of compound numbers.

63. Make for yourself and perform five examples in addition, five in subtraction, five in multiplication, and five in division of compound numbers, using the denominations of Troy, Avoirdupois, Apothecaries' weights, and of English money.

LESSON IV.

LONG MEASURE, CLOTH MEASURE, AND SURVEYOR'S MEASURE.

1. Write the table for Long Measure; for Cloth Measure; for Surveyor's Measure.

2. If you were going to buy silk for a dress or cloth for a coat, would you buy it by the foot, the yard, the ell, or the inch?

3. If you were getting the length of the schoolroom, would you estimate it by yards, by feet, or by inches?

4. The unit of measure in buying dry goods is the yard.

5. How many inches in a yard? in $\frac{1}{2}$ yard? in $\frac{1}{4}$ yard? in $\frac{3}{4}$ yard? in $\frac{1}{3}$ yard? in $\frac{2}{3}$ yard?

6. What part of 1 yard is 1 foot? is 2 feet? is 3 feet?

7. How many inches in $2\frac{1}{2}$ yards?

8. How many inches in 1 yard and 2 feet? in $\frac{1}{6}$ yard? in $\frac{1}{2}$ foot?

9. What would $12\frac{1}{2}$ yards of silk cost at $2.50 per yard?

10. What will $16\frac{1}{4}$ yards of ribbon cost at $.12$\frac{1}{2}$ a yard?

11. What will ½ yard of ribbon cost at $3.00 a yard?

12. What would 28 yards of cotton cloth cost at 16⅔ cents a yard? Remember you can multiply by 16⅔ by a very easy contraction.

13. How much print could be bought for a dollar and a quarter at 5 cents a yard?

14. What change would you get from a ten-dollar bill after paying for 2¾ yards of broadcloth at $2.50 per yard?

15. Perform all the examples under cloth measure in your arithmetic.

16. What is the unit of measure in estimating distances?

17. What part of a mile is a furlong? is a rod? is a foot?

18. How many feet in a mile? in ½ mile? in 1 rod? in a furlong? in ¼ mile? in ⅛ mile?

19. Reduce 25 deg. 19 m. 7 fur. 20 rds. 9 ft. 10 in. to inches.

20. Reduce 289764 feet to higher denominations.

21. How many rods in a mile? in ¼ mile? in ½ mile? in ¾ mile?

22. What part of a mile is 1 rod? is 320 rods? is 160 rods? is 80 rods? is 40 rods?

23. What part of a mile would you walk in going 4 times over a distance of 80 rods?

24. It is 400 rods from John's house to the church. How many miles does he walk in going to church and returning?

25. Mont Blanc, Switzerland, is 15780 feet high.

How many feet less than 3 miles high is this mountain?

26. Give the names of 4 mountains which are over 3 miles high.

27. Do we speak of distances as so many feet, miles, or rods?

28. Would you say "It is half a mile to the Post Office," or "It is 160 rods to the Post Office," or "It is 2640 feet to the Post Office"?

29. Are the heights of mountains given in your geography in feet or in miles?

30. Would you give the length of a building in feet, in yards, or in rods? The height of a tree? The distance of a cloud from the earth? The height of a steeple or of a monument? The depth of a pond? The length of a river? The width of a street? Distance at sea? Distance by rail? The length of your fishing-rod?

31. Longitude and latitude are estimated by what unit of measure?

32. How many miles in a degree of latitude?

33. How many degrees in a circle of the earth?

34. Is a degree of longitude any given distance?

35. What is the length of a degree of longitude at the equator? At the poles?

36. How many degrees in any circle?

37. Draw a circle.

38. Has the circle you have drawn as many degrees as a circle of the earth?

39. Could you measure a degree on your ring? Why not?

40. Could you measure the degrees of a circle as large as a carriage wheel?

41. If a carriage wheel has 18 spokes, how many degrees from one spoke to another?

42. Are there as many degrees at the hub of the wheel as at the outer edge where the tire is set?

43. How many degrees are there at the hub? at the tire?

44. If the wheel is 10 feet in circumference, what part of an inch is 1 degree of the circumference?

45. What is meant by the circumference of the wheel? What by its diameter?

46. If there are 360 degrees in a circle of the earth, and 69$\frac{1}{6}$ miles in a degree, how many miles in a circle of the earth?

47. Look in your geography, and see if you have found the circumference of the earth.

48. What is longitude? latitude? Where is the equator?

49. How many miles in ten degrees of longitude at the equator? in ten degrees of latitude?

50. What is a meridian?

51. How many feet in 40 rods?

52. What part of a mile is 40 rods?

53. How many yards in 10 rods?

54. How many rods in a mile?

55. How many feet in $\frac{1}{8}$ of a mile?

56. How many feet in a furlong?

57. Perform all the examples in your arithmetic under Long Measure and Cloth Measure.

58. Add:

deg.	m.	fur.	rds.	ft.	in.
65	10	2	35	12	5
100	55	7	14	9	11

Subtract:

yds.	qrs.	na.	in.
27	2	1	2
9	3	2	2

LESSON V.

1. For what is Square Measure used?

2. Give the table for Square Measure.

3. How many acres in a field 25 rods long and 8 rods wide?

4. How many acres in a city lot $\frac{1}{8}$ mile long on each side? Draw a diagram of the lot.

5. How many rods in $\frac{1}{8}$ of a mile?

6. Would the lot be square?

7. Is the above field square?

8. Draw a figure representing a garden 10 rods long and 8 rods wide.

9. How many square feet in the above garden?

10. What part of an acre is 80 square rods?

11. How many feet in an acre?

12. How many rods in a rood?

13. If there are 40 square rods in one rood, how many roods in the above garden, which contains 80 square rods?

14. What part of an acre is 80 square rods? is 40 square rods?

15. What part of an acre is 1 rood? is 3 roods? is 2 roods? is 4 roods?

16. What part of a mile is one acre?

17. How many acres in ½ square mile? in ¼ square mile?

18. How many acres in a wood lot 80 rods long and 50 rods wide?

19. Mr. Smith's farm extends ½ mile on the road and a mile back from the road; how many acres in the farm?

20. Mr. Baldwin's farm is square, and it is just four miles around the four sides; how many acres in Mr. Baldwin's farm?

21. How many more acres in Mr. Baldwin's than in Mr. Smith's farm?

22. How many blocks of buildings in one mile in Philadelphia, where there is one block in every 660 feet?

23. How many such blocks in 1 square mile?

24. In 83710975 square inches how many acres?

25. Reduce 15 A. 1 R. 12 p. to square feet, and back to acres.

26. Perform all the examples in your arithmetic under Square Measure.

27. Is there an acre in a play-ground which is 8 rods wide and 25 rods long?

28. How many square yards of carpeting are required for a floor 18 feet long and 10 feet wide?

29. How many square feet in a window 6 feet long and 2½ feet wide?

30. How do you find the contents of a square?

31. How many square feet on one side of a stone wall ½ mile long and 6 feet high?

32. How many square inches on both sides of a board 24 feet long and 8½ inches wide?

33. How many square feet in a carriage robe 6 feet long and 4½ feet wide?

34. How many yards of trimming would be required to finish the edge of the above robe?

35. How many square yards in a flag 22 feet long and 10½ feet wide?

36. How many square feet in an awning 6 yards long and 5 feet and 6 inches wide?

37. How many napkins, 24 inches by 24 inches, can be cut from a piece of damask 24 inches wide and 16 yards long?

38. Can one denomination be multiplied by another?

39. Which must, in reality, always be the abstract number, the multiplier or the multiplicand? *Answer.* However we place the numbers for convenience, the multiplier is always an abstract number. If 197 yards of cloth are bought at $12.00 per yard, although we might perform the work by placing 12 under 197 for convenience; thus,

$$\begin{array}{r} 197 \\ \underline{12} \\ 2364 \end{array}$$

it is not 12 times 197 yards, but 197 times $12.00, which is $2364.00.

40. How many square feet in a surface 3 feet long and 4 inches wide? 1 rod long and 4 feet wide? 6 feet 6 inches long and 9 inches wide? 3 feet 5 inches long by 2 feet 1 inch wide? 4 feet 6 inches long by 2 feet wide? ½ mile long by 40 rods wide?

41. Multiply:

A.	R.	P.	ft.
100	3	18	50
			9

Divide:

	S. M.	A.	R.
14)	17	100	1

42. Multiply 5 examples and divide 5 examples similar to the above.

43. To find the square contents of a surface, you multiply the length by the breadth; consequently, if you have the contents and the length given, you would find the breadth by dividing the contents by the length; or, if the contents and breadth are given, the length is found by dividing the contents by the breadth.

44. How wide is a table 5 feet long, the top of which contains 15 square feet?

45. Show by a diagram the top of this table divided into square feet.

46. Draw such a table, and indicate the square feet.

47. Are the squares in the diagram perfect squares?

48. Why are not the squares in the drawing perfect squares?

49. Which side of the table must be shorter in a drawing, the side nearest or farthest from you?

50. How many feet long is a room nine feet wide, the floor of which contains 108 square feet?

51. If a field containing 160 square rods is 20 rods long, what is its width?

52. If your small slate is 1 foot long, and contains 96 square inches, what is its width?

53. What is the length of your large slate, which contains 125 square inches and is 9 inches wide?

54. Go to the blackboard and draw a slate 9 inches wide and 12½ inches long, showing the square inches, and draw a frame around the slate.

55. How many straight lines did you have to draw, in order to represent 125 square inches?

56. What is the depth of a city lot containing 80 square rods, which has 80 feet on the front?

57. How many rows of squares on a checker-board having 64 squares and 8 squares in a row?

58. Make and perform five problems where one dimension of a surface is to be found from the square contents and the other dimension.

59. Make and perform five problems where the square contents of a surface are to be found from the length and breadth.

LESSON VI.

1. How many dimensions has a line?

2. How many dimensions has a surface?

3. How many dimensions has a solid?

4. Mention something which has length, breadth, and thickness.

5. Mention something which has length and breadth.

6. Mention something which has only length.

7. How many dimensions has a cube?

8. How many sides has a cube? Draw a cube.

9. Write the table for Cubic Measure.

10. How do you find the contents of a cube? *Answer.* Multiply the numbers denoting the length, breadth, and thickness together.

11. How many cubic feet in a cube 2 feet long, 2 feet high, and 2 feet wide? Draw such a cube, showing the feet.

12. How many cubic inches in a block of wood 6 inches long, 4 inches wide, and 10 inches high?

13. What is a cubic foot? a cubic yard?

14. How many feet in length is a cubic yard? How many in thickness? How many in width?

15. How many cubic feet in a room 16 feet long, 8 feet 6 inches high, and 9 feet wide?

16. How many cubic inches of space in a box 1 foot long, 9 inches wide, and 4 inches deep on the inside?

17. What is the contents of a cistern 8 feet deep, the floor of which is 12 feet square?

18. How many cubic yards in a bin 7 feet long, 3 feet deep, and 5 feet wide?

19. How many cubic feet of air in a room 10 feet high and 12 feet square?

20. Have you ever seen a pile of what is called "cord wood"?

21. How long are the sticks of wood cut?

22. How high is the pile?

23. How long must the pile be to make just one cord of wood?

24. Give the dimensions, in feet, of a pile of cord wood containing 2 cords of wood. *Answer.* A pile of cord wood containing two cords, is 4 feet high, 4 feet wide, and 16 feet long.

25. Give the dimensions of a pile of cord wood containing 4 cords of wood; containing 6 cords; containing 10 cords.

26. Multiply together the numbers denoting, in feet, the length, breadth, and height of a cord of wood, and see if you get the same number of cubic feet as that given in the table.

27. In a pile of cord wood 32 feet long, how many cords?

28. Draw a cord of wood, showing its dimensions.

29. One foot in length of the cord you have drawn is called a cord foot. How high is this cord foot? How wide?

30. If a cord foot is 1 foot long, 4 feet high, and 4 feet wide, how many cubic feet does a cord foot contain?

31. Does your result agree with that given in the table?

32. What part of a cord of wood is 1 cord foot? is 1 cubic foot?

33. Give again the dimensions of a cord of wood.

34. What part of 1 cord foot is 1 cubic foot?

35. When wood is $8.00 a cord, what part of a cord, or how many cord feet, can be bought for $1.00?

36. What will three cord feet of wood cost at the above price?

37. How many cubic inches in a block of marble 15 feet long, 5 feet wide, and 4 feet high?

38. Reduce 3 C. 6 cu. ft. to cubic inches.

39. Reduce 8648021 cu. in. to cords.

40. Perform all the examples in your Common School Arithmetic under Cubic Measure.

41. Write and perform 10 problems requiring the use of the table for Cubic Measure.

42. How many dimensions has a cube?

43. If the contents of a cube and two of its dimensions are given, the other dimension may be found by dividing the solid contents by the product of the two given dimensions.

44. How high is a block of wood 24 inches long and 12 inches wide, containing 1728 cubic inches? *Answer.* A block of wood 24 inches long and 12 inches wide, containing 1728 cubic inches, is 6 inches high. $24 \times 12 = 288$; $1728 \div 288 = 6$.

45. How deep is a cistern 5 feet long and 4 feet wide, containing 90 cubic feet?

46. How high is a stepping-stone which is 4 feet long, 2½ feet wide, containing 15 cubic feet?

47. Find the height of a room 15 feet long, 12 feet wide, containing 1620 cubic feet of air.

48. How many cubic inches in a block of wood 1 foot long, 1 foot wide, and 1 foot high?

49. How high is a block of wood 12 inches long, 1 foot wide, containing 1728 cubic inches?

50. How many cubes 1 inch each way can be cut from 1 cubic foot?

51. How many cubic feet in 1 cubic yard?

52. How many cubes 1 foot each way must you have to build a cubic yard?

53. How many blocks would stand on the floor?

54. How many blocks high would the pile be?

55. If you should add 27 more blocks to the pile, either on the top or at one side, would the pile still be a cube?

56. How many yards must be added to 1 cubic yard, in order to keep the pile a cube? You can illustrate with small cubes.

57. How many cubic feet in a cube two yards on a side?

58. How thick is a block of marble 7 feet high, 4 feet long, containing 84 cubic feet?

59. How many cubic feet of space in a chimney 70 feet high, and 2 feet one way by 1 foot and 6 inches the other way?

60. Find the contents of a box 3 feet long, 18 inches wide, and 2 feet high?

61. How is the height of a solid found, when the length, breadth, and solid contents are given?

62. How do you find the solid contents from the length, breadth, and thickness?

63. How is one dimension found from the contents and the other two dimensions?

64. Write and perform six problems requiring the contents of a solid to be found from the length, breadth, and thickness.

65. Write and perform four problems requiring one dimension of a solid to be found from the contents and the other two dimensions.

66. What is a solid?

67. What is a surface?

68. What is a line?

LESSON VII.

1. For what is Liquid or Wine Measure used?
2. Give the table for Wine Measure.
3. For what is Dry Measure used?
4. Give the table for Dry Measure.
5. What part of a pint is 1 gill?
6. What part of a quart is 1 gill?
7. What is 1 gill of milk worth at 8 cents a quart?
8. What is 1 pint worth at 6 cents a quart?
9. Which is most, ½ quart, 1 pint, or 4 gills?
10. How many gills in 1 quart?
11. What will 2 gallons of milk cost at 6 cents a quart?
12. How many gallons in 1 tun of wine?
13. What will a butt of whiskey cost at $1.00 a quart?
14. What will a tun of wine cost at 62½ cents a quart?
15. Do all hogsheads hold just 63 gallons?
16. What will a hogshead of oil, containing 75 gallons, bring at 16⅔ cents a gallon?
17. What will 5 hogsheads of molasses cost at 10 cents a quart?
18. How many pints in a barrel of cider which contains 32 gallons?
19. How many gills in 1 pipe?
20. What part of a hogshead is 1 gallon?
21. What part of a gallon is 1 quart?
22. What part of a quart is 1 pint?

23. What part of a pint is 1 gill?

24. What part of a tun is 1 hogshead?

25. How many hogsheads in 1 tun?

26. How many quart bottles can be put up from 2 butts of brandy?

27. Perform all the examples under Wine Measure in your arithmetic.

28. Write the table for Dry Measure.

29. What part of a bushel is 1 peck? 1 quart? 1 pint?

30. How many quarts of oats will a horse eat in a day if he is fed a peck every morning?

31. How many days would 1 bushel last?

32. How much is 3 pecks of oats worth? Ask some one, if you do not know.

33. How long will it take a horse to eat $10.00 worth of oats if he eats a peck a day?

34. How much is a bushel of blueberries worth at 5 cents a quart?

35. Perform all the examples in your arithmetic under Dry Measure.

36. Write and perform 5 problems in Wine Measure, and 5 in Dry Measure.

37. What are the casks in which fish are packed? in which nails are packed? butter? sugar? lard? coffee?

38. In what are eggs put up for market? In what is salt? In what are dried figs? dates? berries? peaches? pickles? sealed fruits and vegetables? sardines? crackers? nuts?

39. Add:

tuns	hhd.	gals.	qts.	pts.
14	2	12	3	1
12	3	40	3	2
15	1	37	1	1

Subtract:

bu.	pks.	qts.	pts.
18	1	7	1
10	3	7	2

40. Make 4 examples similar to the above in addition, and 4 in subtraction.

41. Draw three cups which shall represent the relative size of a gill, a pint, and a quart.

42. Draw a pint measure, a quart measure, a peck measure, and a bushel measure.

43. Is coal bought and sold by weight or by measure?

44. There are 231 cubic inches in 1 gallon, Liquid Measure. How many cubic inches in a hogshead containing 63 gallons?

45. How many cubic inches in 10 gallons?

46. How many cubic inches in 1 quart? in 1 pint?

47. How many cubic inches in a cask which holds 10 gallons?

48. How many cubic feet in 63 gallons?

49. Which contains the greater number of cubic inches, a hogshead of 63 gallons, or a box 6 feet long, 2 feet wide, and 2 feet high?

50. How many cubic inches in a butt of brandy?

51. How many cubic feet in a tun of wine?

52. How many gallons in 4620 cu. in.?

53. How many quarts in 693 cu. in.?

54. How many cubic inches in 1 gill?

55. How many gills in 927 cu. in.?

56. Miss Barton's inkstand is 2 inches long, 2 inches wide, and 1 inch high. How many cu. in. does it contain? Does it hold 1 gill? Does it hold half a gill?

57. How many cu. in. in a barrel of cider containing 36 gallons?

58. How many cu. in. in a water-pail which holds 3 gallons?

59. How many cu. ft. in a cistern 5 feet long, 4 feet wide, and 5 feet high? How many cubic inches? How many gallons does it contain?

60. How many cu. in. in a cistern which holds 207360 gallons? How many cu. ft.?

61. If the above cistern is 6 feet long and 5 feet wide, what is its height?

62. How many cu. in. in one-half gallon of vinegar?

63. How many cu. in. in a jug which holds a gallon and a half?

64. What will a quart bottle of wine be worth which is filled from a cask which holds 27720 cu. in., and is worth $960.00?

LESSON VIII.

TIME MEASURE AND CIRCULAR MEASURE.

1. Write the table for Time Measure; for Circular Measure.

2. Perform the examples in your Common School Arithmetic under Time Measure.

3. How often does Leap Year occur?

4. Is this Leap Year? How can you tell by reckoning whether it is or not?

5. How many more days in leap year than in an ordinary year?

6. To which month is the extra day added?

7. Is any month besides February variable in length?

8. Write the names of the months which have 31 days.

9. How many months are there which have 30 days?

10. What part of a year is 1 day?

11. What part of a week is 1 day?

12. What part of a month is 1 day?

13. Which is the first month in the year? the seventh month? the ninth month? the twelfth month?

14. What part of a year is 1 month? is 4 months? is 3 months? is 6 months?

15. How many months in ½ year? in ⅓ year? in ¼ year? in ⅙ year?

16. How many hours in 1 day?

17. How many minutes in 1 day?

18. How many seconds in 1 day?

19. How many hours are indicated on the face of the school-room clock?

20. How do you distinguish 10 o'clock in the morning from 10 o'clock at night?

21. How do you express the morning hour? How the afternoon hour?

22. How should you write 12 o'clock at noon? How 12 o'clock midnight?

23. What part of a leap year is 1 day?

24. What part of a common year is 1 day?

25. How many hours are there from 10 A.M. to 10 P.M.?

26. How many hours from 8.30 A.M. to 12 M.?

27. Draw the face of a watch with the hands at 6 A.M.

28. Is there anything on the face of a watch or clock to distinguish a morning hour from an afternoon hour?

29. If timepieces were so changed as to represent the whole 24 hours, what would the noon hour be?

30. Which hours would be unchanged?

31. What would 3 P.M. then be? 6 P.M.? 6 A.M.? 9 A.M.? 9 P.M.? 1 A.M.?

32. What would 24 o'clock be in the present time? 18 o'clock? 15 o'clock? 19 o'clock? 11 o'clock? 6 o'clock? 12 o'clock?

33. At what other part of the world is the time the same as here?

34. Is it earlier or later east of here?

35. Is it earlier or later west of here?

36. Through how many degrees of a circle does the earth turn in 24 hours?

37. What part of a circle is 360 degrees?

38. If, then, the earth moves through an entire circle or 360° (degrees) in 24 hours, through how many degrees does it move in 1 hour?

39. If the earth moves through 15° (degrees) in 1 hour, in how many minutes will it move 1 degree?

40. It would then be how many minutes later than it is here, at a place 1° east of here? 10° east? 13° east?

41. It would be how many minutes earlier 5° west of here?

42. Just how many degrees east of here must a place be situated to be 1 hour later? 2 hours later? 3 hours?

43. How many degrees west of here must a place be to have the time an hour earlier than ours? 2 hours earlier? 3 hours? 1½ hours?

44. It is how many hours after sunrise in England when the sun rises on the Atlantic coast of the United States?

45. How many degrees of longitude from Maine to California?

46. To find this, consult the map of the United States.

47. If it were just 60°, how many hours faster would the clocks be in Maine than in California?

48. If a New York gentleman were to go to St. Louis, would his watch be too fast or too slow upon reaching St. Louis?

49. If he should then set his watch by St. Louis time, would it be too fast or too slow on his return to New York?

50. About what time is it in England now? In Chicago? In Portland, Maine? In California? In Florida? In Salt Lake City? In Mexico? At the point in Asia directly opposite us? At Hudson Strait? At Santiago? At the Azores? At Rio Janeiro?

51. Reduce 3 yrs. 6 wks. 4 dys. 9 hrs. 10 mins. 5 secs. to seconds.

52. Reduce 93640751 seconds to days.

53. Write the table for Circular Measure.

54. Are the minutes and seconds of Circular Measure the same as the minutes and seconds of Time Measure?

55. Are any of the denominations of Circular Measure fixed distances?

56. Are the denominations of Linear Measure fixed distances?

57. Which has the greater number of degrees, a circle 1 mile in circumference or a circle 1 inch in circumference?

58. What is the circle of the Zodiac?

59. What table of measure do astronomers use in reckoning the revolutions of the heavenly bodies?

60. Add:

s.	°	′	″
10	25	30	45
9	16	23	20
4	13	19	37

Subtract:

s.	°	′	″
15	28	42	12
2	29	12	48

61. Reduce 25° 51′ 11″ to seconds.

62. 179467 seconds are how many degrees?

63. Draw a circle.

64. How many degrees in the circle you have drawn?

65. How many degrees in $\frac{1}{4}$ of the circle? in $\frac{1}{10}$ of the circle?

66. Could you measure one of the degrees of the *circle* you have drawn? Why not?

67. How much is the circumference of a wheel which is one inch to a degree?

68. What is the diameter of a wheel which is 360 inches in circumference?

69. Did you ever see a wheel 10 feet in diameter?

70. How many degrees is the circumference of the earth?

71. How many miles in the circumference of the earth?

72. If the circumference of the earth is 25000 miles, and is also 360 degrees, how many miles are there in 1 degree of the circumference of the earth?

73. How many inches are there in 1 degree of the circumference of a wheel which is 360 inches in circumference?

74. There is a system of weights and measures in which all denominations vary in a uniform scale of 10, called the Metric System, which you can learn from your Common School Arithmetic.

75. This will be much more simple than the present system of Compound Numbers. Scholars are trying to bring it into universal use, and when they have done so, doubtless miles, yards, pounds, quarts, etc., will be nearly forgotten, and then children will be taught only the new system, and will wonder how we ever learned so many different tables.

76. There is also an attempt to establish a universal currency in order that there need be no exchange from one currency to another between different countries; and denomination of this currency will vary in a uniform scale of 10.

SECTION V. — PERCENTAGE.

LESSON I.

1. Percentage means "by the hundred."

2. The whole of any quantity under consideration is 100 per cent of that quantity.

3. $\frac{1}{100}$ of anything is 1 per cent; $\frac{2}{100}$ is 2 per cent.

4. $\frac{1}{2}$ of anything is 50 per cent.

5. What is 100 per cent of a mile?

6. What per cent of a mile is $\frac{1}{2}$ of a mile?

7. *Per cent* is derived from the Latin *per centum*, meaning "by the hundred."

8. If you had $25.00, and should spend all of it, what per cent of your money would you spend?

9. If you were to spend one-half of it, what per cent would you spend?

10. If you were to save $1.00 in every $100.00 that you earn, what per cent of your money would you save?

11. If you save $10.00 in every $100.00 that you earn, what per cent do you save?

12. What is 100 per cent of $1.00? of $100.00? of a ton of coal? of a dozen oranges? of a flock of 100 sheep?

13. What is 50 per cent of $1.00? of a school of 40 scholars?

14. 50 per cent of any sum or quantity is what fraction of that quantity?

15. What number is 50 per cent of your arithmetic class?

16. What per cent of a bushel of apples is $\frac{1}{2}$ bushel?

17. The sign % is often used instead of the words "per cent."

18. Write 6% decimally. *Answer.* .06.

19. Write 10 per cent decimally; 4 per cent; 40 per cent.

20. Write 3% decimally; 5%; 9%; 12%; 25%.

21. The whole of a number is 100% of that number. Any other per cent is found by multiplying the number by the rate per cent.

22. What is 100% of 12. *Answer.* 100 per cent of 12 is 12.

23. What is 100% of 40? of 75? of 103?

24. Find 50 per cent of $20.00.

$$\$20.00 \times .50 = \$10.00.$$

25. 10 is what fraction of 20? what per cent of 20?

26. What per cent of any number is $\frac{1}{2}$ of that number?

27. What per cent of any number is $\frac{1}{10}$ of that number?

28. Find 50 per cent of 1000 in two ways.

$$1000 \times .50 = 500; \ \tfrac{1}{2} \text{ of } 1000 \text{ is } 500.$$

29. Find 7 per cent of 368. $368 \times .07 = 25.76$.

30. What is 50 per cent of 30 yards of broadcloth?

31. Find 50 per cent of $30.00 in two ways.

32. Tommy had 16 ducks, and sold 50 per cent of them; how many had he left?

33. Mr. Saunders took 20 per cent of a school of 50 children to drive. How many did he take?

34. What is 6% of 132? 4 % of 220? 10% of 90? 1½% of 360? 3½% of 85? 9¾% of 64?

35. If I should tell you I had spent 1% of my money, how many dollars in every hundred would you understand that to be? If I had $1000.00, how many dollars should I have spent?

36. What does "per cent" mean?

37. In a family of 12 persons 25% had the measles; how many of the family had the measles?

38. What fraction of 12 is 25% of that number?

39. What per cent of 12 is 6?

40. What per cent of 100 is 1? is 2? is 8? is 3? is 20? is 50? is 9? is 10? is 25? is 4?

41. What per cent of 50 is 25?

42. What per cent of 10 is 1? is 10? is 5?

43. What per cent of a number is ½ of that number?

44. What per cent of 10 is ½ of 10?

45. What per cent of 100 is ¼ of 100?

46. What per cent of 100 is ¾ of 100?

47. A party of 10 gentlemen and ladies went yachting; 60 per cent of the number were gentlemen. What per cent were ladies? How many ladies were there? How many gentlemen were there?

48. Etta took a dozen books into the country to read during vacation; 75 per cent of them were novels, and the rest were histories. What per cent were histories? How many novels did she take? How many histories? What fraction of the books were novels? What fraction were histories?

49. Find 5% of 362; 8% of 270; .04 of 36; 9 per cent of 82; 12½% of 342; 25 per cent of 637; .01 of 3900.

50. What per cent of 20 is 20? of 12 is 12? of 8 is 8?

51. What is 100 per cent of 1?

52. Is a number multiplied by 5 or by 5 hundredths to get 5 per cent of it?

53. By what is a number multiplied to get 8 per cent of it?

54. What is 100 per cent of any number?

55. What fraction of a number is 50 per cent of it? is 75 per cent of it? is 5 per cent? is 20 per cent? is 10 per cent?

56. By what is a number divided to find 50 per cent of it? Illustrate with the number 16. $16 \times .50 = 8$; $16 \div 2 = 8$. Illustrate with the number 40.

57. By what is a number divided to find 25 per cent of it? Illustrate.

58. Find 20 per cent of 3645 by both processes.

59. If you wish to get 6 per cent of a number, would you divide by 16⅔? Why not? Would the result be the same as from multiplying by .06?

60. Do we usually multiply or divide to find a given per cent of a number?

61. How do we find the per cent one number is of another?

62. What per cent of 12 is 6. *Answer.* 6 is $\frac{6}{12}$ or $\frac{1}{2}$ of 12, and $\frac{1}{2}$ of 12 is 50 per cent of that number.

63. What per cent of 450 is 45? of 1000 is 100? of 100 is 10? of 75 is 75? of 400 is 80? of 16 is 4? of 20 is 4?

64. Mr. Lewis left 50 per cent of his property to his son, 25 per cent to his daughter, and the remainder, which amounted to $1000, to his grandson. What was the value of his estate?

65. Write and perform a problem similar to the above.

LESSON II.

1. What per cent of a peck is 1 quart?

2. What per cent of a quart is 1 pint?

3. What per cent of a mile is 1 furlong?

4. What per cent of a mile is 4 furlongs?

5. What per cent of a mile is 320 rods?

6. Of a class of 20 pupils there is an average daily attendance of 15 pupils. What is the per cent of attendance?

7. Write and perform a problem similar to the above.

8. Peter bought a lot of marbles for 10 cents, and sold them for 9 cents. What per cent of his money did he lose by the transaction?

9. Write and perform a problem similar to the above.

10. A property worth $10000.00 rents for 7% of its value; what is the rent?

11. Write and perform a problem similar to the above.

12. What per cent of a foot is one inch?

13. What per cent of 1 foot and six inches is one inch?

14. Write and answer a question similar to the above.

15. What per cent is expressed by the fraction $\frac{1}{2}$? $\frac{1}{3}$? $\frac{2}{3}$? $\frac{1}{4}$? $\frac{3}{4}$? $\frac{1}{5}$? $\frac{2}{5}$? $\frac{3}{5}$? $\frac{4}{5}$? $\frac{1}{6}$? $\frac{2}{6}$? $\frac{4}{6}$? $\frac{5}{6}$? $\frac{1}{7}$? $\frac{3}{7}$? $\frac{2}{7}$?

16. What is $\frac{1}{2}$ of 1 per cent? $\frac{1}{2}$ per cent $= .00\frac{1}{2}$; or expressed decimally; .005; or expressed as a common fraction; $\frac{1}{200}$.

17. $\frac{1}{4}$ per cent $= .00\frac{1}{4} = .0025 = \frac{1}{300}$.

18. $\frac{1}{5}\% = ?$ $\frac{2}{5}\% = ?$ $\frac{3}{5}\% = ?$ $\frac{4}{5}\% = ?$ $\frac{3}{4}\% = ?$
$\frac{1}{6}\% = ?$ $\frac{1}{7}\% = ?$ $\frac{1}{10}\% = ?$ $\frac{2}{10}\% = ?$ $\frac{3}{10}\% = ?$

19. In a regiment of 1000 soldiers $\frac{1}{2}\%$ died of sunstroke, 1% of fever, 10% of wounds, and 25% were killed in action; what per cent died? How many soldiers died? How many were left in the regiment?

20. James started for market with a basket containing 5 dozen eggs, but had the misfortune to drop the basket and break 25% of them; how much would he get for the remaining eggs at $0.18 a dozen?

21. Write and perform a problem similar to the above.

22. $\frac{3}{4}$ of 24 is 25% of what number?

23. 6% of 200 is 10% of what number?

24. 24 is $\frac{1}{2}\%$ of what number?

25. 250 is $12\frac{1}{2}\%$ of what number?

26. Write and answer five questions similar to the above.

27. What per cent of 1 is 10? *Answer.* 10 is 1000% of 1. Since 1 is 100% of 1, 10 is 10 times 100%, which is 1000%.

28. What per cent of 25 is 100? of 2 is 4? of 5 is 30?

29. What is 225% of 62? 200% of 40? 125% of 1000?

30. Henry spent 5% of his money, and then had $47.50 left; how much money had he before spending any?

31. Of a school of 45 scholars, all but 20% went to the May Day Entertainment. How many went and how many did not go?

32. Write and perform five problems similar to the last.

LESSON III.

PROFIT AND LOSS.

1. When the buying price of goods is more than the selling price, the difference is called "loss"; when less, it is called "profit."

2. If Jacob buys a knife for a dollar and sells it for 80 cents, what is his loss? What is his loss per cent?

3. If a crate of crockery which costs $100.00 is sold for $150.00, what is the gain per cent? What is the actual gain?

4. Owen & Moore bought a lot of Christmas goods for $800.00, and sold them at a profit of 20%; for how much were the goods sold?

5. Mr. Roberts bought a beef for $90.00, and peddled it out for $99.00; what per cent did he gain? How much did he gain?

He bought a firkin of butter for $40.00, but found it somewhat damaged, and was obliged to sell it for $35. What per cent of his money did he get back? What per cent did he lose? How many dollars did he lose? Did he gain or lose by both transactions? What per cent did he make on the money invested in both?

6. What per cent of 130 is 4? *Answer.* 4 is $3\frac{1}{13}\%$ of 130.

$$\begin{array}{r} 130)400(3 \\ \underline{390} \\ \hline \dfrac{1|0}{13|0} \end{array}$$

7. What must be paid for a load of shingles in order that there may be a gain of 10% in selling them for $220.00? *Answer.* $200.00 must be paid for the load of shingles. If $220.00 is 10% gain, it is 110% of the cost; and if 220 is 110%, 1% would be $2.00, and 100% would be $200.00.

8. If a barrel of flour sells for $9.60 at a profit of 20%, what was its cost?

9. What must be paid for a set of encyclopedias which will sell for $80.00 at a profit of 25%?

10. Write and perform four problems similar to the last.

11. Mr. Jose sold 10 French clocks for $475.00, which was a loss of 5% on the purchase; how much did the clocks cost apiece on an average? For what did they sell apiece on an average?

12. If a block of buildings which cost $25000.00 is sold at an advance of 8%, what will the block bring?

13. E. Churchill & Co. paid $8000.00 for a cargo of East India goods, which they sold for $12000.00. What per cent did they make on their investment?

14. Write and perform two problems similar to the last.

LESSON IV.

COMMISSION AND BROKERAGE.

1. Commission paid to a broker for his services is called "brokerage."

2. The commission is reckoned at a rate per cent.

3. The sum left after the payment of the commission is called "net proceeds."

4. Who is a broker?

5. What kind of business does he transact for which he is paid a commission?

6. What business would a real estate broker do? a commission merchant? a collector?

7. A flour-mill in Minnesota sent $1000.00 worth of flour to a commission merchant in New York, who received 2% commission for selling the flour. What was his commission, and what did the manufactory get for its flour?

8. Why should the owners of the mill send to a commission merchant instead of going themselves to New York to sell the flour?

9. A South Carolina planter sent $1200.00 worth of cotton to a broker in Charleston, who charged 7% commission. How much did the planter get for his cotton? How much more would it have cost him to effect the sale, had he spent $100.00 in going to Charleston and selling the cotton himself?

10. If a real estate broker sells a house on a commission of 5%, what is his commission, if the house sells for $8500.00? What sum does the owner of the house get?

11. What is the value of a cargo of tea for which a St. Louis wholesale dealer pays his agent in New York $7600.00 and a commission of 5% for buying?

12. What is the difference between a wholesale and a retail business?

13. A consignment of butter from a Vermont merchant was sold by his Boston agent for $2575.00. The net proceeds were $2523.50. What was the per cent of commission? What was the amount of commission?

14. What is the amount of a debt for which a collector receives $35.00, at a commission of 1¾%?

15. What will a tax-collector's commission be at 1½% on a sum of $10000?

16. What are the net proceeds from rents upon which the agent gets a commission of $75.00 at 1%?

17. What is the commission at 2%, on the sale of an estate which brings $4500.00?

18. How many hundred-dollar shares of railroad stocks can be bought for $1000.00 after the broker has a commission of 1% for the purchase?

19. A woolen factory sent $40000.00 worth of goods to a New York agent, who had 2% commission for selling the goods. What were the net proceeds to the manufacturer after paying $125.00 for freight and other expenses in transportation?

20. A salesman in a large Boston house has 1% commission on the value of all the goods he sells. How many dollars' worth of goods must he sell in a year, in addition to a salary of $1000.00, in order to have an income of $3000.00?

21. What would Tommy's commission amount to, if his mother should give him 4% of the value of all the eggs he could find, and he should find twenty dozen at $0.28 a dozen?

22. Write and perform four examples similar to some of the foregoing.

LESSON V.

INSURANCE.

1. What is the object of insurance?

2. How can an insurance company afford to pay for property which is burned or otherwise destroyed?

3. What is the sum of money called which is paid for a guarantee that property shall be paid for, in case it is destroyed by fire or accident?

4. Under what circumstances must premiums of insurance be paid?

5. Do you suppose your father's house is insured?

6. If so, how often does he have to pay an annual premium?

7. For what is the premium paid?

8. How is it computed?

9. As long as the house is secure from accident, does he get any return for his money?

10. Under what circumstances would he get a return from the insurance company?

11. Do you suppose property is insured for its entire value? Why not?

12. What is life insurance?

13. If a man's life were insured, to whom would his insurance money go in the event of his death?

14. Who are a man's heirs?

15. Who are your father's heirs? Your mother's?

16. When is a man's mother his heir?

17. When his brothers and sisters? When his children? When his uncles and aunts?

18. What is paid for a life insurance policy?

19. How often is the premium usually paid?

20. What is the man called who does business for an insurance company?

21. Where does the company get the money which constitutes its capital?

22. What is the writing or agreement between the party insured and the company insuring called?

23. Who holds the insurance policy?

24. Who is the "underwriter"?

25. What is the policy?

26. What is the premium?

27. Under what circumstances is a policy forfeited?

28. If the premium has been paid on a policy for a number of years and is then discontinued, after which

the property is destroyed, can insurance be collected?

29. What is the annual premium on a life insurance policy for $4000.00 at 2%?

30. Who would have to pay the greater premium for a policy of the same amount, a young person in health, or an infirm and aged person?

31. How much would a gentleman pay annually on a policy for $10000.00 at the rate of 7%?

32. What is the premium on a house valued at $6000.00 and insured at 90% of its value, at the rate of 4%? What loss would the insurance company sustain if the house were destroyed at the end of 5 years?

33. How much premium money would the owner have paid in that time?

34. What premium of insurance is paid on a vessel worth $30000.00 at the rate of 2½%?

LESSON VI.

TAXES AND DUTIES.

1. For what purpose are taxes and duties raised?

2. Where does the money come from which pays the President of the United States? the Governors of States? the police? the expenses of towns? of States? of the general government?

3. Who are taxed?

4. Are all taxed alike? Are all taxed in the same ratio?

5. How are taxes reckoned?

6. How much greater would be the tax of a man who was worth $100000.00 than of one who was worth $50000.00?

7. What is a poll tax?

8. Who have to pay poll taxes?

9. How old is a man when he is first taxed?

10. Does a woman pay tax upon property which she holds in her own name?

11. Does a woman pay a poll tax?

12. What would be the annual road tax of a farmer whose farm and other property were worth $3000.00 at ½%, or 5 mills on a dollar?

13. Who determins the value of a man's farm, and of other property for taxation?

14. Take any common school arithmetic, and perform all the problems under Taxes.

15. Who collects the taxes?

16. Who pays the men who build the highways?

17. Who pays the men who lay the pavements in city streets?

18. Are gas-pipes and water-pipes paid for from the money raised by taxation? Are sewer-pipes? Are horse-car tracks?

19. Who pay for building railroad bridges?

20. Who pay for building highway bridges?

21. Who pay for lighting the streets of a city?

22. How is the money raised which is expended by act of legislature for schools, asylums, and other charities?

23. How is money raised to support the Military

Academy at West Point? the Naval School at Annapolis? the Army of the United States?

24. Is the post-office business supported by government?

25. Is the express business supported by government?

26. Who is an assessor?

27. Who is a collector?

28. What are duties?

29. Where are duties collected?

30. Are duties collected by States or by the general government?

31. Who appoint Custom-house officers?

32. Do you suppose there is a Custom house at Boston? at Philadelphia? at New Orleans? at Cincinnati?

33. Why should you think there would not be a Custom house at Cincinnati?

34. Did you ever see a revenue stamp?

35. Ask your teacher to explain the use of revenue stamps.

36. Write what you know of the "Stamp Act," which led to the War of the Revolution.

37. Do you remember when drafts, checks, and other business papers required revenue stamps? Explain why they were stamped.

38. What duty does an importer pay on an invoice of French silks which cost $5000.00 at the rate of 12%?

39. Who is an importer?

40. What is the duty, at 5 cents a gallon, on 600 hogsheads of molasses?

SECTION VI. — INTEREST AND DISCOUNT.

LESSON I.

1. "Interest" is payment made for the use of money.

2. If a sum of money is borrowed, with interest to be paid at the rate of 6 per cent, for how long is it understood the money may be kept at that rate, that is, for six dollars on every hundred dollars?

3. If paid at the end of a year, how much would be paid for each hundred dollars borrowed?

4. The "principal" is the sum loaned.

5. The "amount" is the principal and interest together.

6. How much interest must be paid at the end of a year on $100.00, at the rate of 6%?

7. If the loan were paid at the end of 1 year, what would the "amount" be?

8. What is meant by the amount?

9. What is interest?

10. What is meant by the rate per cent?

11. What is legal interest?

12. What does "legal" mean?

13. When more than legal interest is taken for the use of money, what is it called?

14. What is the most common legal rate of interest?

15. What is the legal rate of interest in your State?

16. If money is loaned at the rate of 5%, how much interest is paid on $100.00 for 1 year? for 2 years? for 3 years? for 4 years? for 6 years? for 10 years?

17. Is the interest on $100.00 for 6 months at 6% $6.00? Why not?

18. What is interest?

19. What is the interest of $100.00 for 1 year, at 4%?

20. What is the interest of $100.00 for 6 months, at 4%?

21. What is the interest of $200.00 for 6 months, at 4%? at 8%? at 7%? at 2%? at 5%? at 6%?

22. What is the interest of $375.00 for 1 year, at 5%?

23. What is the amount of $375.00 for 1 year, at 5%?

24. What is the amount of $375.00 for 2 years, at 6%?

25. What is the interest of $1000.00 for 5 years, at 6%? What is the amount?

26. How many months in one year?

27. What part of the interest for 1 year is the interest for 1 month?

28. The interest of $100.00 for 1 year at 6% is $6.00. What part of $6.00 is the interest for 1 month?

29. What is $\frac{1}{12}$ of $6.00?

30. What part of the interest for 1 year is the interest for 2 months? for 3 months? for 4 months? for 5 months? for 6 months? for 7 months? for 8 months? for 9 months? for 10 months? for 11 months?

31. What fraction of a year is 1 month? is 3 months? is 6 months? is 7 months? is 9 months? is 11 months?

32. How many months in $\frac{1}{2}$ of a year? in $\frac{1}{4}$ of a year? in $\frac{1}{3}$ of a year? in $\frac{1}{6}$ of a year? in $\frac{7}{12}$ of a year? in $\frac{5}{12}$ of a year? in $\frac{2}{3}$ of a year? in $\frac{3}{4}$ of a year? in $\frac{11}{12}$ of a year?

33. By what would you divide the interest for 1 year to find the interest for 6 months? for 3 months? for 4 months? for 2 months?

34. If the interest on a certain sum of money is $12.00 for 1 year, what is it for 1 month? for 6 months? for 3 months? for 9 months? for 5 months? for 2 months? for 4 months? for 7 months? for 8 months? for 10 months?

35. If the interest of $600.00 is $36.00 a year, what is the interest for 10 months? for 2 months? for 5 months? for 6 months? for 8 months? for 9 months? for 1 month?

36. By what is the interest of 1 year divided to find the interest for 1 month? for 2 months? for 3 months? for 4 months? for 6 months?

37. How would you find the interest for 5 months, the interest for one month being found?

38. How many days in 1 month?

39. What part of the interest for 1 month is the interest for 1 day?

40. The interest of $1.00 for 1 year at 6% is $.06; hence, for 1 month, it is $\frac{1}{12}$ of $.06, which is $.005 (5 mills); and since 5 mills is the interest for 1 month or 30 days, 1 mill is the interest for 6 days, and the interest for 1 day is $\frac{1}{6}$ of a mill.

41. What part of 5 mills is $\frac{1}{6}$ of a mill? *Answer.* $\frac{1}{6}$ of a mill is $\frac{1}{30}$ of 5 mills.

42. One method for finding the interest on any sum of money, for any time, at any rate per cent, is first to find the interest on one dollar for the given time at 6 per cent, and from this interest to find the interest on the given sum at the given rate. This is called the 6 per cent method.

43. Learn the rule for the 6 per cent method of computing interest. You will find it in the Appendix.

LESSON II.

1. There are other methods of computing interest, which you will find in your common school arithmetic when your teacher wishes you to learn them.

2. The *six per cent method* is used for any rate per cent, by first finding the interest at 6%, and taking such a part of that interest as the given rate is of 6 per cent.

3. The interest at 3% would be $\frac{1}{2}$ of that at 6%.

4. What fraction of the interest at 6% is the interest at 5%? at 4%? at 1%? at 7%? at 3%? at 9%? at 12%?

5. Find the interest on $1200.00 for 5 years 4 months 18 days, at 6%.

Solution. The interest on 1 dollar at 6%,

for 1 yr. is $0.06, for 5 yrs. is $0.30
for 1 mo. is $0.005, for 4 mos. is $0.02
for 1 day is $0.00⅙, for 18 days is $0.003
$0.323

If $.323 is the interest on $1.00 for the given rate and time, the interest on $1200.00 is 1200 times $.323, or, as it is usually considered, .323 of $1200.00, $1200.00 × .323 = $387.60.

6. The interest on the same sum for the same time at 12% is twice $387.60.

7. What is the interest on the same sum at the same time, at 3%? at 4%? at 8%? at 2%? at 1%?

8. Find, as above, the interest on $1500.00 for 6 years 2 months 24 days, at 6%.

9. Why do you suppose 6 per cent is first found instead of some other per cent?

10. If there were 14 months in a year instead of 12, would it then be more convenient to use 6 per cent or 7 per cent in computing interest for the months?

11. Would 7 be as convenient a rate at which to compute the days as 6 per cent?

12. How many days are considered a month in computing interest?

13. In the above method, why is 1 cent reckoned as the interest on 1 dollar for 2 months?

14. Why is 5 mills reckoned as the interest for 1 month?

15. Why is 1 mill reckoned as the interest for 6 days?

16. Why is $\frac{1}{6}$ of a mill reckoned as the interest for 1 day?

17. What is the interest for 5 days?

18. Write $\frac{5}{6}$ of a mill in decimals; $\frac{2}{6}$ or $\frac{1}{6}$ of a mill.

19. Find, as above, the interest on $2000.00 for 1 yr. 5 mos. 21 dys., at 6%.

20. What is the interest of $3951.00 for 1 yr. 12 dys., at 6%?

21. Of $75.00 for 6 mos., at 3%?

22. Of $1375.00 for 30 dys., at 6%? at 3%? at 12%?

23. Of $1500.00 for 1 yr. 2 mos. 12 dys., at 4%?

24. Of $3752.00 for 3 yrs. 7 mos. 21 dys., at 4%?

25. Of $1246.00 for 7 yrs. 5 mos. 18 dys., at 8%?

26. Write and perform ten examples similar to the above, with different sums as principal, for different times, and at different rates, and give the amount of each.

27. Banks and business men use interest tables which show the interest on one dollar at any rate per cent for any time.

LESSON III.

1. If only the dates are given at which time money is borrowed and when paid, how is the time found?

2. How long is it from Jan. 1, 1881, to Jan. 1, 1882? from Feb. 3, 1879, to Feb. 3, 1884? from Jan. 1, 1880, to July 1, 1881? from March 13, 1883, to

March 13, 1885? from Nov. 6, 1882, to Nov. 6, 1885? from Dec. 1, 1883, to Dec. 1, 1885? from June 10, 1863, to Oct. 12, 1870?

1870	10	12
1863	6	20
7 yrs.	3 mos.	22 dys.

From what is 20 subtracted? from what is 6?

Why is 10 written for October, and 6 for June?

Why is 20 subtracted from 42? Why is 6 subtracted from 9?

3. How long is it from March 7, 1882, to July 1, 1883?

4. What is the interest on $3685.00 from July 1, 1879, to July 1, 1884, at 6%?

5. What is the amount of $964.00 from July 15, 1870, to Jan. 15, 1880, at 7%?

6. What is the interest of $1000.00 from Feb. 12, 1864, to Sept. 1, 1877, at 4½ per cent?

7. Write and perform ten problems similar to the last three.

8. How long is it since Jan. 1, 1880? since July 1, 1500?

9. What year and day was just 100 years ago?

10. When money is borrowed, what is given in exchange?

11. What is a promissory note?

12. Write a note for $500.00 payable on demand, at 6% per annum.

13. Write another note, for $6000.00, to be paid in one year, the interest to be paid semi-annually, at 5%.

14. What is the person called who holds the note, that is, who has loaned the money?

15. What is the person called who has given or drawn a note?

16. What is meant by the endorsement of a note?

17. Why is a note endorsed?

18. What is the person called who endorses a note?

19. If A borrows money of B, who holds the note? Who gives the note? Who signs the note?

20. What does C do in order to endorse the note?

21. Has C any business interest in the note, that is, is the transaction of any advantage to him?

22. Why, then, should C sign the note?

23. In case A fails to pay the money, who must pay it?

24. When a note is partially paid at different times, what are the payments called?

25. Learn the rule in the appendix for finding the amount of a note which has been paid in partial payments or endorsements.

26. Write a note for $200.00 payable on demand at 4% interest, and dated June 1, 1883. Endorse on the back of the note a payment of $100.00 made June 1, 1884, and find the amount due June 1, 1885.

27. Write a note for $1000.00 payable on demand at 6% interest, and dated July 15, 1880. Endorse on the back of the note a payment of $200.00 made Jan. 15, 1881, and another, of $59.00, July 15, 1882, and find the amount due May 3, 1885.

Solution.

$$\begin{array}{rl}
\$1000 & \\
.03 & \\
\hline
30.00 & \text{interest from July 15, 1880, to Jan. 15, 1881.} \\
1000 & \\
\hline
1030.00 & \\
200.00 & \text{endorsement.} \\
\hline
830.00 & \text{amount due Jan. 15, 1881.} \\
.09 & \\
\hline
74.70 & \text{interest from Jan. 15, 1881, to July 15, 1882.} \\
830.00 & \\
\hline
904.70 & \\
59.00 & \text{endorsement.} \\
\hline
845.70 & \text{due July 15, 1882.} \\
.158 & \\
\hline
67656 & \\
42285 & \\
8457 & \\
\hline
133.6206 & \text{interest from July 15, 1882, to May 3, 1885.} \\
845.70 & \\
\hline
\$979.32 & \text{due May 3, 1885.}
\end{array}$$

28. Write another note, for a different principal, at the same rate per cent, with the same endorsements and the same dates, and find the amount due at the settlement of the note.

29. Write another note, with different principal, rate per cent, dates, and endorsements.

30. Perform all the examples under partial payments in your Common School Arithmetic.

31. Write four notes with partial payments, and work them out.

LESSON IV.

1. You have before had the principal, time, and rate per cent given to find the interest and the amount.

2. When the *principal*, *interest*, and *time* are given, the *rate per cent* is found by dividing the given interest by the interest on the given principal, for the given time, at 1 per cent.

3. If the interest on a certain sum of money for a certain time is $72.00, the rate per cent being unknown, and the interest on the same sum for the same time at 1% is $8.00, the rate per cent is as many times greater than 1% as 72 is greater than 8, which is 9 times; hence 9 per cent is the rate which gave $72.00 interest.

4. What rate per cent of interest is paid on $2000.00 in order to get $320.00 interest in 4 years?

5. At what rate per cent will $640.00 produce $57.60 in 3 years?

6. What is the rate per cent when the interest on $600.00 for 2 years is $72.00?

7. At what rate per cent will $1000.00 amount to $1200.00 in 5 years?

8. Write and perform ten examples similar to the three last.

9. At what rate per cent will $200.00 be doubled in 16 years?

10. At what rate per cent will any sum be doubled in 16 years?

11. At what rate per cent will any sum be doubled in 10 years?

Illustrate with $10.00 as principal.

12. When the *principal*, *interest* or *amount*, and *rate per cent* are given, the time is found by dividing the given interest by the interest on the principal at the given rate per cent for one year.

13. If the interest on $500.00 at 8% is $20.00, the time is as many years, or such part of a year, as $20.00 is of the interest of $500.00 at 8% for 1 year, which is $40.00. $20.00 is ½ of $40.00; hence the time is ½ year, or 6 months.

14. Find the interest of $500.00 for 6 mos., at 8%.

15. Find the time in which the interest on $320.00 will be $48.00, at 5%.

16. Find the time in which $8000.00 will amount to $8640.00, at 4%.

17. In what time will a sum of money double itself, at 10%?

18. Find the time in which $175.00 will amount to $203.00, at 2%.

19. In how many years will the interest on $800.00 be $96.00, at 6%?

20. Write and answer ten questions similar to the last three.

21. When the *interest, time*, and *rate* are given, the *principal* is found by dividing the given interest by the interest on $1.00 at the given rate and time.

22. What principal will produce $24.00 interest in 4 years, at 6%?

The interest on $1.00 for 4 yrs. at 6% is $.24. $24.00 divided by $.24 equals 100.

The given interest, $24.00, is 100 times as great as the interest on $1.00; hence the principal is 100 times $1.00, which is $100.00.

23. Find the principal that will produce $22.50 interest in 10 yrs., at 3%.

24. Find the principal which will produce $45.00 in 5 years, at 3%.

25. What principal will give $90.00 in 2 yrs. 6 mos., at 12%?

26. What principal will give $582.50 in 10 yrs., at 4½%?

27. Write and answer ten questions like the above.

28. When the *amount*, *time*, and *rate per cent* are given, the *principal* is found by dividing the given amount by the amount of $1.00 at the given time and rate.

29. What principal will amount to $2700.00 in 7 yrs., at 5%?

The amount of $1.00 for 7 yrs. at 5% is $1.35, and $1.35 will go in $2700.00, 2000 times, and the principal is 2000 times $1.00.

30. What principal amounts to $4106.64 in 6 yrs. 10 mos., at 6%? to $86.40 in 5 yrs., at 2%?

31. What principal amounts to $1057.50 for 3 yrs. 6 mos., at 5%?

32. Write and answer ten questions like the last.

33. What is *Compound* Interest?

34. Do savings banks allow compound interest on deposits?

35. Is compound interest understood in a note which is written "with interest annually"?

36. Find the amount of $500.00 for 3 yrs. at 4%, at compound interest.

$500.00 × .04 = $20.00. 520. × .04 = $20.80.
$540.80 × .04 = $21.632. *Answer.* $562.43.

37. What will be the amount of $10000.00 in 4 yrs. at 5½%, compound interest?

LESSON V.

1. When the holder of a promissory note sells the note, the sum paid for the note is less than the sum named in the note, and is called the "proceeds" of the note, and the difference between the proceeds and the sum named is called the "discount."

2. Discount is reckoned at so much per cent. This per cent is called the "rate of discount."

3. If you give your father a note for $100.00 payable in 1 yr., without interest, could he sell the note immediately for $100? Why not?

4. For how much can he sell the note? *Answer.* He can sell the note for a sum which, placed on interest for 1 year, will amount to $100.00.

5. When is a note nominally due?

6. When legally due?

7. What is meant by "three days of grace"?

8. When a note falls due on Sunday or on a legal holiday, when is it payable?

9. What is the present worth and discount of $45000.00 due in 10 yrs., at 5%?

The amount of \$1.00 for 10 yrs. at 5% is \$1.50. 45000 ÷ 1.50 = \$3000.00.

10. What is the present worth and discount of \$907.20 for 1 yr., at 5%?

11. Discount used in ordinary business transactions is a per cent off, without reference to time.

12. A business done upon credit allows a discount for money paid down.

13. Jones & Carpenter buy a bill of goods for \$2000.00 in Boston. The money is not due for three months; how much less would their bill be if paid down at 3% discount?

$$\$2000 \div \$1.03 = \$1941.74;$$
$$\$2000 - \$1941.74 = \$58.26.$$

Their bill would be \$58.26 less, if paid down.

14. What is received down for a bill of \$5000.00 due in 6 mos., at 4% discount?

15. What is the discount on \$600.00, at 5%? at ½%?

SECTION VII. — PROPORTION.

LESSON I.

1. The relative magnitude of two numbers is called their "ratio," and is expressed by the fraction which the first number is of the second.

2. The "ratio," of 3 to 4 is $\frac{3}{4}$, that is, 3 is $\frac{3}{4}$ of 4.

3. The ratio of 12 to 9 is $\frac{12}{9}$, that is, 12 is $\frac{12}{9}$ of 9.

4. What is the ratio of 6 to 12? of 12 to 6? of 9 to 18?

5. When two ratios are equal, the four terms are in proportion, and are called "proportional."

6. The ratio of 3 to 6 is $\frac{3}{6}$, or $\frac{1}{2}$. The ratio of 10 to 20 is $\frac{10}{20}$, or $\frac{1}{2}$; hence, the ratios being equal, the terms are proportional, and 3 is to 6 as 10 is to 20.

7. The first number of each ratio is called its "antecedent," and the second number its "consequent."

8. Are the numbers 2, 3, 4, and 5 proportional?

9. Are the numbers 2, 3, 4, and 6 proportional?

10. Are the numbers 3, 12, 5, and 20 proportional?

11. Write four terms which are proportional.

12. The first and last terms of a proportion are called the "extremes," and the two middle terms are called the "means." The product of the extremes is equal to the product of the means.

13. In the proportion $3:12::9:36$, what are the extremes? What is the product of the extremes? What is the product of the means?

14. What is the product of the extremes in the proportion 3 : 5 : : 6 : 10? What is the product of the means?

15. If three terms of a proportion are given, how can the fourth term be found? *Answer.* When three terms of a proportion are given, the fourth term is found by dividing the product of the terms which are alike by the other term.

16. If 3, 5, and 6 of the above proportion are given, how is 10 found? *Answer.* 5 and 6, which are the means, are multiplied together, and their product is divided by 3, the given extreme, which gives 10, the fourth term of the other extreme.

17. If 3, 6, and 10 are given, how is 5 found?

18. If 3, 5, and 10 are given, how is 6 found?

19. If 5, 6, and 10 are given, how is 3 found?

20. Write three terms of a proportion, and find the fourth.

21. Finding the fourth term of a proportion when three terms are given is called the "Rule of Three."

22. When 12 oranges cost 36 cents, what will 21 oranges cost?

23. The ratio between the cents must be the same as between the oranges; hence, some number must bear the same ratio to 36 cents, the price of 12 oranges, that 21 bears to 12; or,

$$12 : 21 : : 36 : 63$$

$$\begin{array}{r} \underline{36} \\ 126 \\ \underline{63} \\ 12\overline{)756} \\ 63 \end{array}$$

24. If a horse travels 8 miles in 2 hours, how far will he travel in 4 hours?

2 hours is to 4 hours as 8 miles is to what number of miles?

25. If a train runs 30 miles in 60 minutes, how far will it run in 20 minutes?

26. If a horse travels 10 miles in 2½ hours, how far will he travel in 4 hours?

27. If a ship sails 360 miles in one day, how far will it sail in 36 hours?

28. Make and perform ten problems in the Rule of Three, similar to the last.

29. If 2½ yds. of velvet cost $3.00, what will 1¾ yds. cost?

30. If 22½ yds. of gingham will make 2 dresses, how many yards will be required to make 10 dresses?

31. You will find a great number of problems under Proportion, in your Common School Arithmetic.

SECTION VIII.—POWERS AND ROOTS.

LESSON I.

1. The product of a number multiplied by itself is the "square" of that number.

2. Multiply each number from 1 to 12 by itself.

3. What number multiplied by itself equals 4? equals 9? equals 25?

4. Of what is 81 the square? 64? 49? 144? 121? 25? 36? 16? 9? 4? 1? 100?

5. The *square root* of a number is one of the two like factors of that number.

6. What is the square root of 100? of 25? of 49? of 64? of 4? of 9? of 625? of 16? of 36? of 81? of 121? of 400?

7. The square root of a number is indicated by the radical sign $\sqrt{}$. $\sqrt{9} = 3$.

8. An exponent is the figure which expresses the power of a number. 8^2 equals 64, 2^2 equals 4, 9^2 equals 81.

9. The cube of a number is the product of a number used three times as a factor.

10. The cube root of a number is one of the three like factors of the number, and is indicated by $\sqrt[3]{}$. $\sqrt[3]{125}$ means "the cube root of 125."

11. To what is 3^2 equal? 3^3? 4^2? 8^2? 12^2? 4^3? 2^4? 25^2? 5^4? 4^4? 5^5?

12. 2^2 is read "2 square." 2^3 is read "2 cube." 2^4 is read "2 fourth power." 2^5 is read "2 fifth power," and so on.

13. What is the fifth power of 2? the cube of 3? the square of 7? the third power of 4?

14. What is the square root of 9, that is, what number multiplied by itself equals 9?

15. What is the square root of 16?

16. What is the cube root of 8, that is, what number multiplied by itself, and the product again by the number, gives 8?

17. What is the cube root of 27?

18. What is the fourth root of 16? *Answer.* 2 is the fourth root of 16. $2 \times 2 \times 2 \times 2 = 16$.

19. $\sqrt{9} =$ how many? *Answer.* $\sqrt{9} = 3$.

20. $\sqrt{4} = ?$ $\sqrt{81} = ?$ $\sqrt{81} = ?$ $\sqrt[3]{8} = ?$
$\sqrt[4]{32} = ?$ $\sqrt{64} = ?$ $\sqrt[3]{27} = ?$ $\sqrt{1} = ?$
$\sqrt[5]{16} = ?$ $\sqrt[3]{1000} = ?$ $\sqrt{100} = ?$ $\sqrt[3]{64} = ?$
$\sqrt{25} = ?$ $\sqrt{625} = ?$ $\sqrt{36} = ?$ $\sqrt{49} = ?$
$\sqrt{144} = ?$ $\sqrt{10000} = ?$ $\sqrt{121} = ?$ $\sqrt{1} = ?$
$\sqrt[5]{64} = ?$ $\sqrt[4]{1} = ?$ $\sqrt[5]{1} = ?$ $\sqrt[6]{1} = ?$

21. The process of extracting roots of numbers too large to compute mentally, at a single glance, is as follows: —

To extract the square root of a number, the figures are first pointed off into periods of two figures each; thus,

Find the square root of $1225 = 1\dot{2}2\dot{5}$. Find the greatest square in the left-hand period, writing its root at the right; thus, $1\dot{2}2\dot{5}(3$. Subtract the square 9 from the left-hand period; thus,

$$\begin{array}{r} 1\dot{2}2\dot{5}(3 \\ \underline{9} \\ 3 \end{array}$$

and to the remainder bring down the next period; thus,

$$\begin{array}{r} 1\dot{2}2\dot{5}(3 \\ \underline{9} \\ 325 \end{array}$$

Double the root found for a divisor, and determine how many times it will go in the dividend exclusive of the right-hand figure, and annex this result to the root and to the divisor; thus,

$$\begin{array}{rr} & 1\dot{2}2\dot{5}(35 \\ & \underline{9} \\ 65) & \underline{325} \end{array}$$

Multiply the divisor by the last figure of the root, and subtract the product from the dividend; thus,

$$\begin{array}{rr} & 1\dot{2}2\dot{5}(35 \\ & \underline{9} \\ 65) & 325 \\ & \underline{\underline{325}} \end{array}$$

22. Prove the work.

23. Proceed with any number of periods, as with the last.

24. Find the square root of 177241, and prove the work.

$$\begin{array}{rl}
 & 1\dot{7}7\dot{2}4\dot{1}(421 \\
 & \underline{16} \\
82) & 172 \\
 & \underline{164} \\
841) & 841 \\
 & \underline{841}
\end{array}$$

25. The square root of decimals is extracted in the same manner as whole numbers; the point must, however, be placed over units, and the periods reckoned from left to right.

26. In finding the square root of 2380.4641, the point is first placed over units, and then over every second figure toward the right and toward the left.

$$2\dot{3}8\dot{0}.4\dot{6}4\dot{1}$$

27. A number which is not a perfect square can be carried out at will by adding periods of decimals in ciphers.

7 is not a perfect square, but ciphers can be added; thus, $\dot{7}.0\dot{0}0\dot{0}0\dot{0}$, as far as desired.

$$\begin{array}{rl}
 & 7.0\dot{0}0\dot{0}0\dot{0}(2645 \\
 & 4 \\
46) & 300 \\
 & \underline{276} \\
524) & 2400 \\
 & \underline{2096} \\
5285) & 30400 \\
 & \underline{26425} \\
 & 3975
\end{array}$$

28. To extract the square root of a common fraction, the square root of the numerator and denominator may be extracted; or, if they are not perfect squares, the fraction may be reduced to a decimal.

29. Find the square root of 55696.

30. What is the square root of 57600?

31. Extract the square root of 837625.

32. What is the square root of 179776?

33. What is the square root of $\frac{16}{144}$?

$$\sqrt{\frac{16}{144}}=\sqrt{\frac{1}{9}}=\frac{1}{3}.$$

34. What is the square root of $\frac{9}{64}$?

$$\sqrt{\frac{9}{64}}=\frac{3}{8}.$$

35. Which is greater, a number or the square root of that number?

36. Which is greater, a fraction or the square root of that fraction? The square root of $\frac{4}{81}$ is $\frac{2}{9}$. Which is greater, $\frac{4}{81}$ or $\frac{2}{9}$?

37. What is the square root of $\frac{9}{16}$? of $\frac{4}{49}$? of $\frac{16}{64}$? of $\frac{2}{3}$? of $\frac{3}{4}$? of $\frac{7}{12}$? of $\frac{1}{2}$?

38. What is the square root of 125.457? of 3.68413? of 91803.62? of 1.34831?

39. In extracting the cube root of a number, the first step is to point it off into periods of three figures each; for example, extract the cube root of 15625.

$$1\dot{5}62\dot{5}$$

We find the greatest cube in the first left-hand period is 8, and place its root at the right.

$$1\dot{5}62\dot{5}(2$$

Subtract this cube from this period, and bring down the next period.

$$\begin{array}{r} 1\dot{5}62\dot{5}(2 \\ \underline{8} \\ 7625 \end{array}$$

Multiply the square of the root found by 300 for a divisor, by which divide the dividend for the next figure of the root.

$$\begin{array}{r} 1\dot{5}62\dot{5}(25 \\ 8 \\ 1200\overline{)7625} \end{array}$$

Multiply the divisor by the last figure of the root, $1200 \times 5 = 6000$; then multiply the square of the last figure of the root by its former figure, and its product by 30, $5 \times 5 = 25$; $25 \times 2 = 50$; $50 \times 30 = 1500$; and to these two results add the cube of the last figure of the root, $6000 + 1500 + 225 = 7625$. This is the subtrahend.

$$\begin{array}{r} 1\dot{5}62\dot{5}(25 \\ 8 \\ 1200\overline{)7625} \\ \underline{7625} \end{array}$$

40. Find the cube root of 1728.
41. Find the cube root of 30664297.
42. Find the cube root of 13161048.
43. Find the cube root of 29791.
44. Find the cube root of 3375.

45. How many inches are there in a block which is 12 inches long, 12 inches wide, and 12 inches high ?

46. How long is each side of a cube containing 1728 cubic inches ?

47. How long is each side of a cube containing 1000 cubic inches?

48. How many square inches in a surface 12 inches long and 12 inches wide ?

49. How many inches in length is a square containing 144 square inches ?

50. How many inches in length is a square containing 625 square inches ?

51. How high is a cube of marble containing 1331 cubic feet ?

52. Perform the examples in your Common School Arithmetic under Square Root and Cube Root.

APPENDIX.

1. To prove addition, when only two numbers are added, subtract either number added from the sum, and, if the work is right, the result will be like the other number.

2. To prove addition, when more than two numbers are added, add in a reverse order; or, add all the numbers but one, and subtract the result from the sum of all the numbers; if the work is right, this result will be like the number not added. Or, add the sum of a part of the numbers to the sum of the remaining part, and if the result is like the sum of the whole, the work is probably right.

3. To prove subtraction, subtract the remainder from the minuend, and if the work is right, the result will be like the subtrahend; or, add the subtrahend and remainder, and, if the work is right, the result will give the minuend.

4. To prove multiplication, multiply the multiplier by the multiplicand, and, if the work is right, this result will be like the first; or, divide the product by either term, and the quotient will be the other term.

5. To prove division, divide the dividend by the quotient, and, if the work is right, the result will

be like the divisor; or, multiply the divisor by the quotient, and the result will be the dividend.

6. To multiply a number by 1, with any number of ciphers annexed, add as many ciphers to the multiplicand as there are ciphers in the multiplier.

7. To divide by 1, with any number of ciphers, cut off from the right of the dividend as many figures as there are ciphers in the divisor; if the figures cut off are significant figures, place them over the divisor as a fractional part of the quotient.

TABLES IN COMPOUND NUMBERS.

ENGLISH MONEY.

4 farthings (fr. or far.)	make	1 penny (*d.*).
12 pence	"	1 shilling (*s.*).
20 shillings	"	1 pound (£).

The character £ stands for the Latin word *libra*, signifying a pound.

A guinea = 21 shillings.
A crown = 5*s.*
A florin = 2*s.*
A sovereign = 20*s.*

Sovereign is the name of the 1-pound coin.

AVOIRDUPOIS WEIGHT.

16 drams (drs.)	make	1 ounce (oz.).
16 ounces	"	1 pound (lb.).
2000 pounds	"	1 ton (T.).
2240 pounds	"	1 long ton.

TROY WEIGHT.

24 grains (grs.) make 1 pennyweight (dwt.).
20 pennyweights " 1 ounce (oz.).
12 ounces " 1 pound (lb.).

APOTHECARIES' WEIGHT.

20 grains (grs.) make 1 scruple (℈).
3 ℈ " 1 dram (ʒ).
8 ʒ " 1 ounce (℥).
12 ℥ " 1 lb. Troy.

A pound Avoirdupois = 7000 grains.
A pound Troy = 5760 grains.
A pound Apothecaries' Weight = 5760 grains.
An ounce Avoirdupois = 437½ grains.
An ounce Troy = 480 grains.
An ounce Apothecaries' Weight = 480 grains.

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196 pounds of flour make a barrel.
200 pounds of pork or beef make a barrel.
100 pounds of fish make a quintal.
56 pounds of corn make a bushel.
50 pounds of corn meal make a bushel.
60 pounds of wheat make a bushel.
32 pounds of oats make a bushel.
14 pounds of lead or iron make a stone.
21½ stone of lead or iron make a pig.

LINEAR OR LONG MEASURE.

12 inches (in.) make 1 foot (ft.).
8 feet " 1 yard (yd.).
5½ yards, or 16½ feet " 1 rod (rd.).
320 rods " 1 mile (m.).
1760 yards " 1 mile.
5280 feet " 1 mile.

A chain = 4 rods.
A line = $\frac{1}{12}$ in.
A hand (horse measure) = 4 in.
A knot (distance at sea) = 6086 ft.
A league = 3 knots.
A fathom (depth at sea) = 6 ft.
A cable = 120 fathoms.

Sound moves 743 miles an hour.
Light moves 12000000 miles a minute.

SQUARE MEASURE, OR THE MEASURE OF SURFACES.

144 square inches (sq. in.) make 1 square foot (sq. ft.).
9 square feet " 1 square yard (sq. yd.).
30¼ square yards, or 272¼ square feet " 1 square rod (sq. rd.).
160 square rods, or 10 square chains " 1 acre (A.).
640 acres " 1 square mile (sq. m.).

CUBIC MEASURE, OR MEASURE OF VOLUME.

1728 cubic inches (cu. in.)	make	1 cubic foot (cu. ft.).
27 cubic feet	"	1 cubic yard (cu. yd.).
40 cubic feet	"	1 ton (T.).
16 cubic feet	"	1 cord foot (c. ft.).
8 cord feet, or 128 cubic feet	"	1 cord of wood (C.).

1. To find the contents of a surface when the length and breadth are given, multiply the numbers denoting its length and breadth together.

2. To find the length of a surface when the breadth and contents are given, divide its contents by its breadth.

3. To find the breadth of a surface when its contents and length are given, divide its contents by its length.

4. To find the contents of a cube when its length, breadth, and height are given, multiply together the numbers denoting its length, breadth, and height.

5. To find one dimension of a solid when its contents and two dimensions are given, divide its contents by the product of the two given dimensions.

A Surface has length and breadth without thickness.

The Area of a figure is its surface of superficial contents.

A Line has length without breadth or thickness.

A Solid has length, breadth, and thickness.

An Angle is the opening of two lines which meet at a point.

The Vertex of an angle is the point where the lines meet.

A Right Angle is an angle formed by one line meeting another perpendicularly.

An Acute Angle is less than a right angle.

An Obtuse Angle is greater than a right angle.

A Triangle is a plane figure having three sides and three angles.

The Altitude of a triangle is a line drawn from one of its angles perpendicular to its opposite side, which is considered its base.

To find the area of a triangle, multiply the base by half the altitude, and the product will be the area.

A Right-Angled Triangle is one which has a right angle.

The long side of a right-angled triangle is its hypothenuse, the other sides are its base and its perpendicular.

To find the *hypothenuse*, the base and perpendicular being given, add the square of the base to the square of the perpendicular, and extract the square root of the sum for the hypothenuse.

To find the *perpendicular*, the base and the hypothenuse being given, subtract the square of the base from the square of the hypothenuse, and extract the square root of the remainder for the perpendicular.

To find the *base*, the hypothenuse and perpendicular being given, subtract the square of the perpendicular from the square of the hypothenuse, and extract the square root of the remainder for the base.

A Quadrilateral is a plane figure having four sides and four angles.

A Parallelogram is a quadrilateral whose opposite sides are parallel.

A Rectangle is a parallelogram with four right angles.

A Square is a rectangle having equal sides.

A Circle is a plane figure bounded by a curved line, every point of which is equally distant from the centre.

The Circumference of a circle is the line which bounds it.

The Diameter of a circle is a straight line drawn through the centre and terminating in the circumference.

To find the circumference of a circle, the diameter being given, multiply the diameter by 3.141592: the product will be the diameter.

To find the diameter of a circle, the circumference being given, multiply the circumference by .318309.

A Solid has length, breadth, and thickness.

A Cube is a solid of equal length, breadth, and thickness, and has all of its six sides squares.

A Sphere is a solid bounded by a continued convex surface, every part of which is equally distant from the centre.

LIQUID MEASURE.

4 gills (gi.) make 1 pint (pt.).
2 pints " 1 quart (qt.).
4 quarts " 1 gallon (gal.).
31½ gallons " 1 barrel (bar.).
63 gallons " 1 hogshead (hhd.).

The term hogshead is applied to any large cask holding 50 or more gallons.

A gallon of Liquid Measure contains 231 cubic inches.

DRY MEASURE.

2 pints (pt.) make 1 quart (qt.).
8 quarts " 1 peck (pk.).
4 pecks " 1 bushel (bu.).
8 bushels " 1 quarter (qu.).

The bushel Dry Measure contains $2150\frac{42}{100}$ cubic inches.

TIME MEASURE.

60 seconds (sec.) make 1 minute (min.).
60 minutes " 1 hour (hr.).
24 hours " 1 day (dy.).
7 days " 1 week (wk.).
365 days (or 52 wks. 1 dy.) " 1 common year (yr.).
366 days " 1 leap year.
100 years " 1 century.

Thirty days hath September,
April, June, and November;
All the rest have thirty-one,
Except the second month alone,
And that hath twenty-eight, in fine,
Till Leap Year makes it twenty-nine.

Generally, all years which can be evenly divided by 4 are leap years.

CIRCULAR MEASURE.

60 seconds (″) make 1 minute (′).
60 minutes " 1 degree (°).
360 degrees " 1 circumference.

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1. To reduce a fraction to its lowest terms, divide both numerator and denominator by any number greater than 1 which will divide them both without a remainder, until they are prime to each other.

2. To reduce an improper fraction to a whole or mixed number, divide the numerator by the denominator.

3. To reduce a mixed number to an improper fraction, multiply the whole number by the denominator of the fraction; to this product add the numerator, and under the product write the given denominator.

4. To reduce fractions to a common denominator, find the least common multiple of their denominators for a common denominator; divide the common denominator by each denominator, and multiply the result by the corresponding numerator for the new numerators.

5. To add fractions, add the numerators when the denominators are alike; when not alike, first reduce them to common denominators.

6. To subtract fractions, they must have a common denominator; then subtract the numerator of the subtrahend from the numerator of the minuend.

7. To multiply fractions, multiply together the numerators for a new numerator and the denominators for a new denominator.

8. To divide one fraction by another, multiply the numerator of the dividend by the denominator of the divisor for the numerator of the quotient, and the denominator of the dividend by the numerator of the divisor for the denominator of the quotient.

9. To reduce a complex to a simple fraction, divide the numerator by the denominator.

THE SIX PER CENT RULE FOR COMPUTING INTEREST.

1. Reckon 6 cents for each year, 1 cent for every two months, 5 mills for the odd month, 1 mill for every 6 days, and for any number of days less than six, as many sixths of a mill as there are days. This will be the interest on 1 dollar at 6 per cent; multiply this by the principal for the interest on the whole sum.

At any other per cent, the interest is such a part of the interest at 6 per cent as the given rate is of 6.

To find the amount, add the interest to the principal.

2. Another method of finding interest of any sum, at any rate per cent, for any time.

Find the interest for one year by multiplying the principal by the rate per cent; and for two or more years, multiply this product by the number of years.

Find the interest for months by taking the most convenient fractional part or parts of one year's interest.

Find the interest for days by taking the most convenient fractional part of one month's interest.

3. Rules for computing interest on notes paid in partial payments:

Find the amount of the principal from the time it becomes due until the time of payment. Then find the amount of each indorsement from the time it was paid until settlement, and subtract this sum from the amount of the principal. Or,

Find the amount on the principal to the time of the first payment; from this subtract the payment, and compute the interest on the remaining sum, till the time of the next payment, with which proceed as before, and so on till the time of settlement.

FOR COMPOUND INTEREST.

4. Find the interest of the given sum for one year; add it to the principal; on this amount find the interest as before, and so continue till settlement.

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